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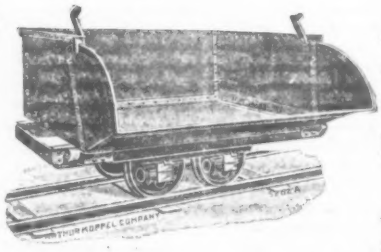

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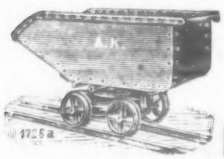

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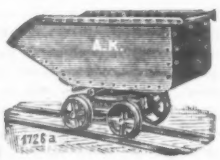

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MUNICIPAL ENGINEERING

VOLUME XXXII. MARCH, NINETEEN HUNDRED SEVEN. NUMBER THREE.

A NORMAL CONCRETE.

By Louis H. Gibson, Architect, Indianapolis, Ind.

The densest concrete is made from the densest aggregate. The aggregate, as we know, is the inert material; the material which, in itself, is without adhesive or cohesive qualities. Each particle of the aggregate has its own inherent strength, and as an aggregate one particle is not related to another, and lends no strength to its neighbor, excepting by the mere fact of contact. There is no adhesion or cohesion in the relation of one particle to another. The cement, in its relation to the concrete, has both an adhesive and a cohesive quality. The cement is cohesive, as related to the cement itself; it is adhesive as related to the aggregate. As to whether the cement is stronger in its adhesive or cohesive quality depends upon the character and the quality of the material to which it is intended to adhere. It is nevertheless true that the density of the aggregate affects the quality of the concrete. We all remember that a few years ago this matter was very well presented in a definite and graphic form by Mr. Newberry, of Sandusky. He indicated very clearly and very forcibly the beneficial relations of the aggregate to the concrete. There are now evidences in the cement worker's world that we are coming to consider more thoroughly than ever before the character of the aggregate. This matter is written to enforce the seriousness of this consideration.

Without making a statement too broad, and without neglecting what has been said and done in this respect, it is fair to say that the question of the formation of the aggregate, in the manufacture of concrete, has been very largely neglected. It is probably true that we have not realized that this neglect has been very largely responsible for many of the failures in concrete work. This is said, not alone in its application to the cement block business as a commercial industry, and from the engineer's point of view, but as well, though not particularly, in its relation to reinforced concrete work, and monolithic work in its various relations. This may apply to all piers, foundations and to decorative forms, and to other structural purposes for which concrete is a medium.

In the making of concrete we have largely disregarded an essential feature in its composition. This may be best illustrated by relating this consideration for the time to the question of reinforced concrete. What have we done with respect to the development of this relatively new and great industrial medium? The idea of reinforced concrete, like many other great ideas, was brought to the engineering world, the scientific world, through unscientific sources. We have the story that the conception of the value of reinforced concrete work was first realized and manifested by a maker of flower pots, and that from this source it expanded. Its beginning was without formula, had a clumsy sort of development, but was of sufficient value to invite the attention of the scientists, the engineers, the schools and the mathematicians. It makes no great difference as to whether the story mentioned, as to the origin of the reinforced concrete idea, was identically true; it is, no doubt, typically true. Most great inventions are brought to the scientific world from the outside. We remember that this general statement is true in the history of steam engineering, electrical engineering, and many of the discoveries in astronomy and the other sciences. It is just as true, however, that none of these inventions or discoveries ever reached the full measure of their value until they were considered carefully, and definitely formulated by the scientist. The flower-pot discovery has, during recent years, been in the hands of our great educational institutions, the scientific builders, and the results of their investigations have been eagerly looked for and readily accepted and adopted by the practical world. Hitherto the ordinary builder

and contractor has looked with somewhat of disregard, if not with apathy, upon the work of the universities as applied to the various mediums of their craft. Not so with respect to reinforced concrete. Everything coming from the testing laboratory has been eagerly sought, and maybe at times too hastily accepted, adopted and used in practice. All the time, however, the movement has been in the right direction. The institutions have been sincere and industrious, and the practical worker has been receptive.

The present situation is somewhat like this, in its relation to reinforced concrete: We have, first, the steel which goes into the concrete. The testing laboratories, up to the present time, have given the most serious and careful consideration to all of the qualities relating to steel. The work relating to this material has been efficient, and, so far as the building world knows, it has been adequate. Steel has been considered time and time again in its various compositions, so that we know definitely and practically just what we may expect of it. It is a fixed factor in our considerations. In the fabrication of reinforced concrete we have considered just as carefully and on the same scientific and practical basis and authority, the character of cement. Every engineer's office, of any importance, which has much to do with cement construction, and every municipality, and many large contractors, have the apparatus for the testing of cements. Records are accurately kept and carefully preserved.

A third element in the fabrication of reinforced concrete is the aggregate. Who will say that it has received the same careful attention, or the same scientific consideration, as the steel? What university or technical institution has records or has formulated data, or has given it out, with respect to the aggregate? In what engineer's office, or where within the records of any great contracting organization, will we find evidence of that scientific consideration of the aggregate which has distinguished steel or cement? One can go to the office of nearly every civil engineer of any municipality and find car numbers, date of receipt, and careful records of the character and quality of the cement. As to the character and quality of the aggregate it is rare indeed if we find one line. Here is a serious break in the chain, certainly a very weak link.

There is always an exception. The manufacturers of bitulithic pavements have probably gone the limit in the analysis and consideration of aggregates. They have theoretically and practically carried the analysis of the aggregate to its ultimate, so far as we know. For example, they have graded the aggregate from the coarsest to the finest; they have gauged and weighed, until in the laboratory they have been able to reduce the voids to 10 per cent. of the gross volume; in practice, in placing their concrete on the street, they have felt safe in supplying 12 per cent. of the cementing material. This concrete, however, was made not with cement. The cementing material is pitch or asphalt. It makes no difference for illustrative purposes as to just what the cementing material is composed of; the principle, so far as it relates to the aggregate, is the same, no matter what is used as the cement in the formation of the concrete. The bitulithic company sift and weigh, mix and analyze the aggregate. In a commercial way the mixture is actually made through the medium of automatic scales, and records and examinations are made by a young man often selected from the manual training and high schools. Thus we see that by the aid of mechanical appliances and low cost of efficient help, the expense of this operation is not great. The point is, that the character of the aggregate is known, and the value of this material is fully realized. It is done on a commercial basis, accurately and at a low cost. The reason for doing this is two fold: First, it is recognized that the best concrete is made from the densest aggregate; second, the cementing material is more expensive than the aggregate. The result is at once scientific and commercial.

An article of this kind is not written without very serious consideration. When one brings into question the performances of his fellows it must be assumed that he does it seriously, and as the result of many conferences with those who are engaged practically and scientifically in the work with which he is interested. One said, "You are right, but are not your exactions ideal?" The answer to that is easy enough. Every problem is ideal before it is practical. The greatest successes that have been made in business are by those who have fixed an ideal and then realized it on a commercial basis. It was the realization of ideals, not alone in the quality of material produced, but the cost of its production, which made a Carnegie fortune and the possibility of the United States Steel Corporation. If one should have outlined, only a few years ago, the processes which have since been adopted in a practical way in the determination of the qualities of cement, he would have been announced as an idealist and a dreamer. Nevertheless, all of these considerations have come into common commercial practice, and steel and cement are subjected to tests and considerations which at one time were considered as mere ideals. All of the practices and performances of the United States Steel Corpora-

tion, which we now recognize as pure matters of business, if they had been presented to the world five, ten or twenty years ago, would have been regarded as dreams.

The situation is just this: We have the educated engineer; we have given him adequate data with respect to the steel; we have provided him the means of satisfactorily determining its qualities. Then we have analyzed and determined the value of cement, and he knows how to test the material, and he is doing it and he is keeping accurate records. Is it not remarkable that the scientific world has disregarded, in a large measure, the consideration of the aggregate, which is quite as important a feature?

It is not expected that at once there will be a universal response to the suggestions herein contained. It is, however, something to consider; and, while not a new annunciation or presented in the light of a discovery, it is expected that in due time the scientific world and the practical world will come to give full attention to the analysis of the inert material — the gravel, the broken stone, their grading, and the sand and its grading.

There is a normal concrete, a concrete which will be the best concrete with given materials. It may be as accurately determined and as much a part of a definite formula as the steel itself. The use of the term "normal concrete" is hardly satisfactory without explanation. When we have made the aggregate as dense as possible we have made the first step in the formation of a normal concrete, and we can only do this when we have scientifically and carefully analyzed the aggregate. When we have supplied to this dense and carefully analyzed and determined aggregate, the proper quantity of the cementing material, we then have the normal concrete. There should not be a large excess, and certainly there should not be a deficiency of cement; either would be a departure from the normal in the formation of the concrete. The problem before us is the formation of a normal concrete, a dense aggregate and a mere sufficiency of the cementing material.

Not until we have filled in the void, not of substance, not of material, but the void in scientific practice, as related to the aggregate, will we be free from the disgusting failures, with respect not alone to reinforced concrete, but to concrete blocks and other concrete mediums of construction.

Is it not fair to assume that within a few years we will look back upon the statements relating to the tests on reinforced concrete beams, for instance, wherein the design of metal work was indicated and the character of the concrete expressed in such terms as 1-2-4, 1-2-5, 1-3-4, 1-3-5, and so forth, as being indefinite and unsatisfactory? The design, with respect to the steel, we know and understand. The design and the material has been definitely determined on a scientific basis. The character of the concrete, as expressed by the figure 1, is understood, and its value realized. However, the 2 and 4 or other factors of the aggregate are not understood, have not been analyzed, and are not as definite or scientific. Is it not true that we may expect to have this loose link repaired? May we not expect to have it as clearly and definitely understood as the other determined conditions?

The following is a crude sort of direction which was given in connection with the formation of concrete, and which was used for reinforced concrete work:

Provide a water-tight box 12 by 12 inches, inside measurement. The cubic contents of this box will be 1,782 cu. in. Place in the box the stone to be used in the work. This means the coarser material. Pour water into the box and on the stone until it is filled. The number of cubic inches of water will indicate the voids of the stone. This may be 700 cu. in. of water, more or less, as determined by the size and character of the coarser material; but whatever it is, these voids should be filled with sand and, say there are 700 cu. in. of water, there should be provided 770 cu. in. of sand. This is 10 per cent. in excess of the actual voids of the coarser material, providing these voids should be 700 cu. in.; but whatever the voids are, there should be 10 per cent. excess of sand. In the same way, pour water on the 770 cu. in. of sand in the box until the water comes to the surface. This may represent 250 cu. in. of water, more or less. To this we add 10 per cent. of cement, which would make 275 cu. in. of cement.

On the above assumption, there should be as follows:

Cement	275 cu. in.
Sand	770 cu. in.
Stone	1,728 cu. in.

altogether, a proportion represented by one, three and six.

Do not assume that the figures will come out exactly as here indicated. They are simply mentioned in this connection for the purpose of illustration. It might be well to have another grade of the material not yet so coarse as the stone, nor so fine as the sand. In this way, there would be three divisions or three sizes of aggregates in addition to the cement. This would depend, however, on the character of the voids.

The sand should be dried in a kiln or oven before testing the voids.

I have undertaken herein to assert a general principle for determining the voids and not to undertake to state just what they will be.

This was a crude suggestion and worked out very well as such. It was given in lieu of the usual denominate formula.

FOUNDATION PROBLEMS IN NEW YORK CITY.

By C. M. Ripley, E. E., New York City.

1. NEW BUILDING FOR THE TRUST COMPANY OF AMERICA, NEW YORK CITY.

The gigantic increase in the erection of skyscrapers in the "Lower Broadway" section of New York City during the past few years has been made in the face of grave and increasing engineering difficulties. A study of the laying of the foundations for the new building of the Trust Company of America (Fig. 1), now nearing completion in the financial section of Wall Street, will bring out forcibly (1) What these problems are and (2) How the talent of engineering contractors has been developed. Less than a dozen years ago the conditions found would have been considered insurmountable obstacles, making impossible the construction of a 25-story building on this site.

As shown in the accompanying plan (Fig. 2) this building is situated between the present United States Trust Company and the Mills buildings. Owing to the prevailing prices of Wall Street real estate, every inch of available space must be utilized, with the result that the foundations of the new buildings must practically "rub elbows" on either side with those of the old.

It is not generally understood that as we approach the southern end of Manhattan Island the bed rock slopes off lower and lower below the surface—so much so that at Wall Street it is 80 feet below the curb and at the Battery between 90 and 100 feet below. It might be mentioned in this connection that the rock appears at water line at about Fourteenth Street, and continues rising as we approach upper Manhattan; so that in building projects in this latter portion of the city, it is often necessary to blast away a miniature mountain before the site is even down to street level. It is due to this characteristic of New York's geological formation that the excavation for the great Pennsylvania Railroad Depot has so often been termed a veritable quarry. In these cases the foundations are supplied by nature.

In striking contrast to such simple foundation problems we have the case at hand: foundations to be laid to bed rock through about 80 feet of quick-sand and water-bearing strata already heavily loaded by adjoining 10-story buildings. In digging, water and soft mud is encountered but a few feet below the street level and were the soft muck pumped out or removed by any of the old-time methods, more of this fluid material would enter the excavation from either side and the adjoining structures would settle and later

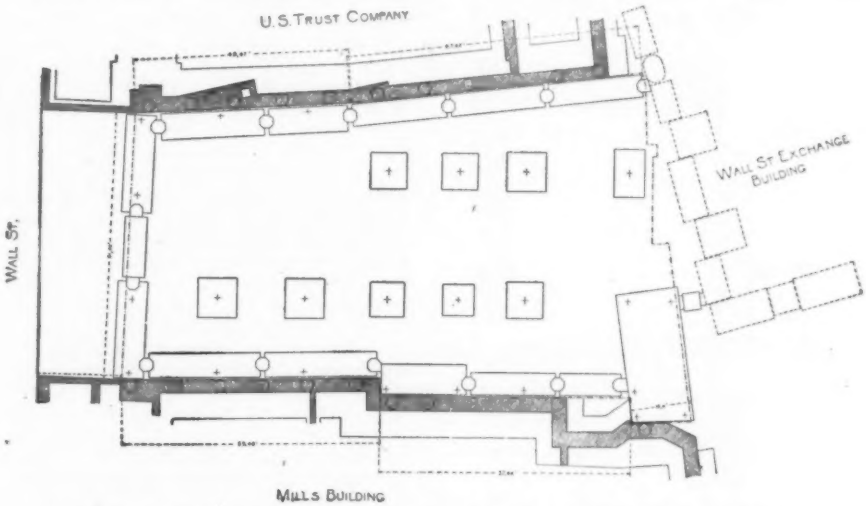
collapse. The Foundation Company, to whom was entrusted the responsibility both of planning and doing this work solved these problems by employing the pneumatic caisson process, in conjunction with the Moran air-lock.

The principle of the air lock was used for the underpinning of the adjoining buildings, as well as for the main part of the work. Fig. 5 shows how work was begun even while the old building was being wrecked. Niches about 5 feet above the cellar floor and 5 feet wide were cut in the walls of the adjoining buildings with electric and steam drills at intervals of about every 6 to 9 feet. These were carried downward through the old foundation and through the sand under the foundation until the water line was struck. Then one 6-foot length of rivited steel pipe, 36 inches in diameter, was jacked down into the sand, thereby employing the weight of the building in constructing the new underpinning A downward opening door was installed at the top of this length, a second was bolted to the first, and then the second downward opening door was installed, completing the miniature air lock. As shown in Fig. 5, compressed air was supplied to the bottom chamber and the work pushed lower and lower through quick-sand and hard pan as successive lengths of pipe were bolted to the top and material was excavated. When rock was reached the entire cylinder was filled with concrete, the steel pipe remained, and when the steel beams were placed, as shown in the left side of Fig. 5, the underpinning at that point was completed. Twelve of these concrete cylinders support the walls of the Mills Building and eleven that of the United States Trust Company Building, as shown by the circles in the shaded portion of Fig. 2.

Twenty-seven concrete piers constitute the foundation work proper under the Trust Company of America building. These piers were sunk to bed rock with remarkable speed, largely because the air lock used allows the material excavated in the caisson to be hoisted to the open air in one continuous haul, being handled but once in transferring from bottom of caisson up to the dumping place, generally a truck. The principle of the lock is shown in Fig. 4.

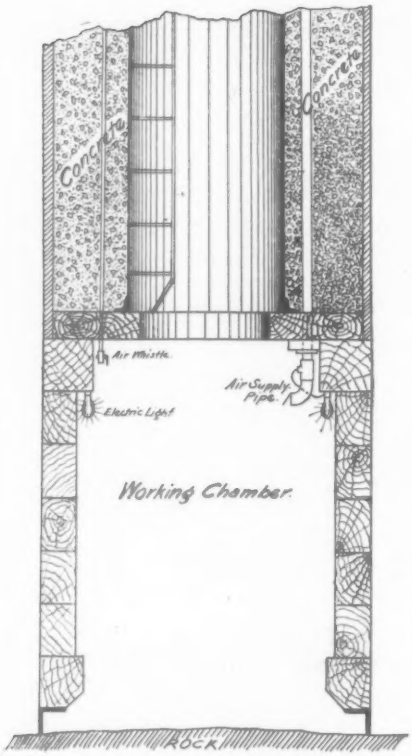
The square and rectangular spaces shown in Fig. 2 give the locations of the concrete piers on the site of the building. In Fig. 6 is shown the 4-boom traveler derrick, which is equipped with four double-drum Lidgerwood hoisting engines, and which effectively covered the entire area. It served to place the caissons, one of which weighed 20 tons and was 14 by 31 by 8 feet high, at their proper locations. It also hoisted men and material in and out of the twenty-seven working chambers. A typical caisson or working chamber is shown in Fig. 3.

Fig. 6 also shows the air lock in place near the top of the picture. The man stooping down on the ground is the gauge tender, who keeps the pressure steady for the convenience of the men in the working chamber, and the man at the air lock communicates signals between the excavators and the engineers.



NEW BUILDING FOR THE TRUST COMPANY OF AMERICA, NEW YORK CITY.

2. Plan of foundation.

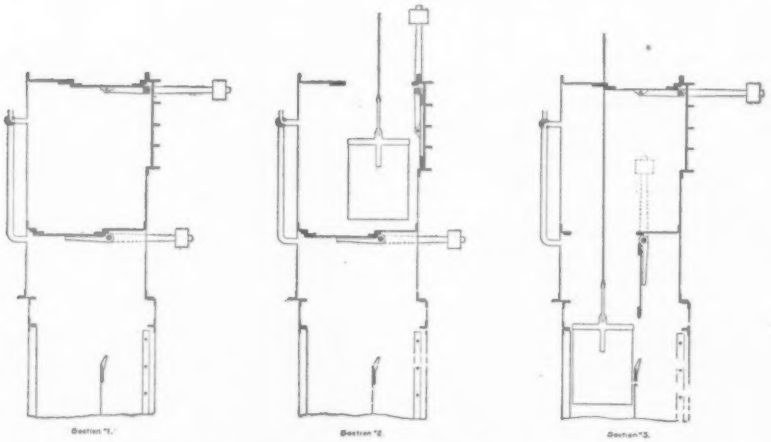


NEW BUILDING FOR THE TRUST COMPANY OF AMERICA, NEW YORK CITY.

3. Caisson for building foundation piers.

The method employed in sinking the concrete piers through the soft soil to bed rock may be described as follows, refering to Fig. 6 in particular:

After the wooden caisson proper had been located accurately, the workmen with picks and shovels excavated inside the open-topped frame, which gradually sank of its own weight. After it had sunk to water level, which was but 4 to 5 feet below the street, preparations were made to apply the compressed air as follows: The open top of the caisson was roofed over temporarily and the first 10-foot section of the steel collapsible working shaft was joined to the upper part of the caisson, as shown in Fig. 3. Section after section was added and then the air lock, as shown in Fig. 6. Then a section of temporary wooden cofferdam was built and fitted to the outside of the caisson so as to extend its sides upward several feet. This was to act as a false work for retaining the successive thin layers of concrete which were dumped into the annular space inside the cofferdam, on the roof of the caisson and surrounding the working shaft, as will be noticed in the right-hand side of section in Fig. 6. After the first 10 feet of concrete had been laid and hardened, a second cofferdam was fitted in a higher position, and the concreting continued, the first cofferdam being later removed and used as the third. One gang of men and one mixer could move from cofferdam to cofferdam, applying about a 2-foot layer in each, so that by the time they returned to the first one it was hardened enough to receive its next layer without distorting the sheeting. Thus nearly the full height and weight of the finished



NEW BUILDING FOR THE TRUST COMPANY OF AMERICA, NEW YORK CITY.

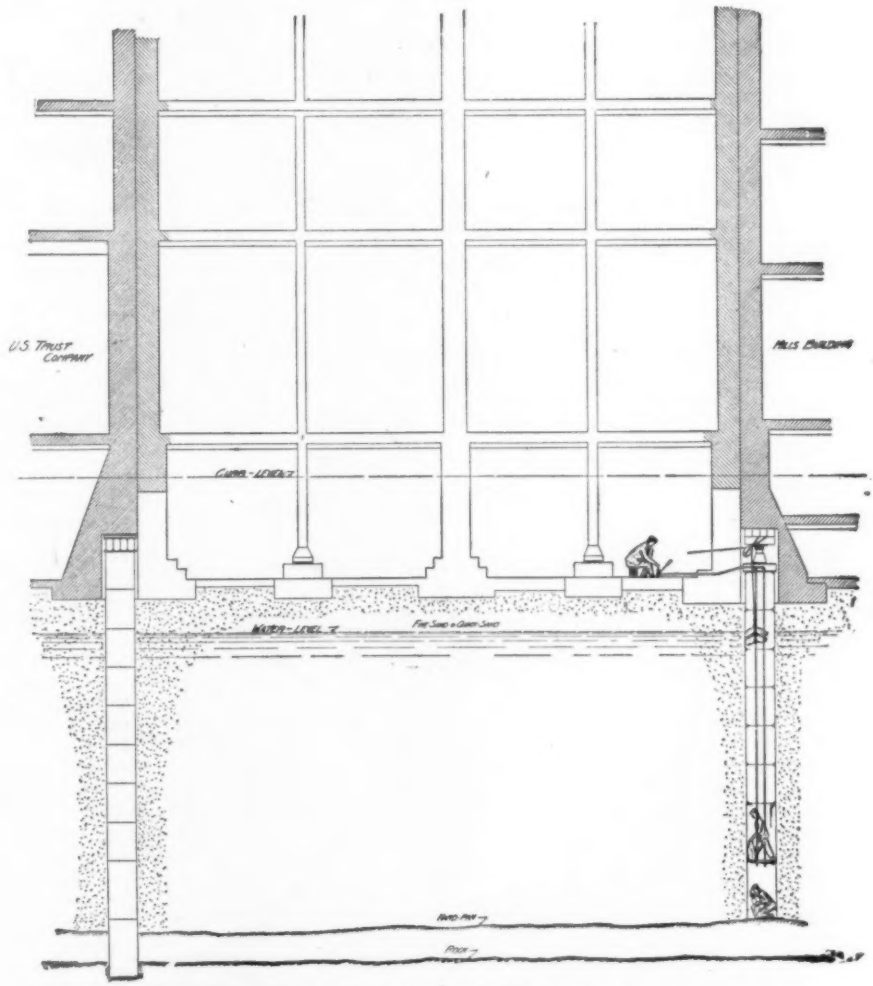
4. Air lock, showing stages of operation.

pier was used to force the caisson down to its final resting place on bed rock, as rapidly as the excavating could be done by the men inside. Alpha Portland cement was used on this job in a 1 to 2½ to 5 mixture.

Referring again to Fig. 3, it will be noticed that the bottom of the caisson sides is sharpened and is known as the cutting edge, since it follows the level of the excavation, pressed down by the great weight above. The contracting firm prepared special 2-ton cast-iron weights to be piled on top of the concrete pier to further sink it, in case the "skin friction" on the sides was too great for the pier to sink of its own weight.

During this process three 8-hour shifts of the laborers were digging out material in the caisson under a pressure of from 18 to 24 pounds per square inch. This material was shoveled into buckets and hoisted up through the working shaft and the air lock out to the open air, all in one continuous lift, as previously explained in connection with Fig. 4.

Upon reaching the rock, its was leveled off and, still under compressed air, the concrete was lowered into the caisson and rammed in place. The entire caisson was filled to the top, the temporary roof was removed, and as the men retreated up the tube they unbolted and removed each section of the collapsible tubing and hoisted it up for use in sinking another caisson. Gradually the entire space previously used



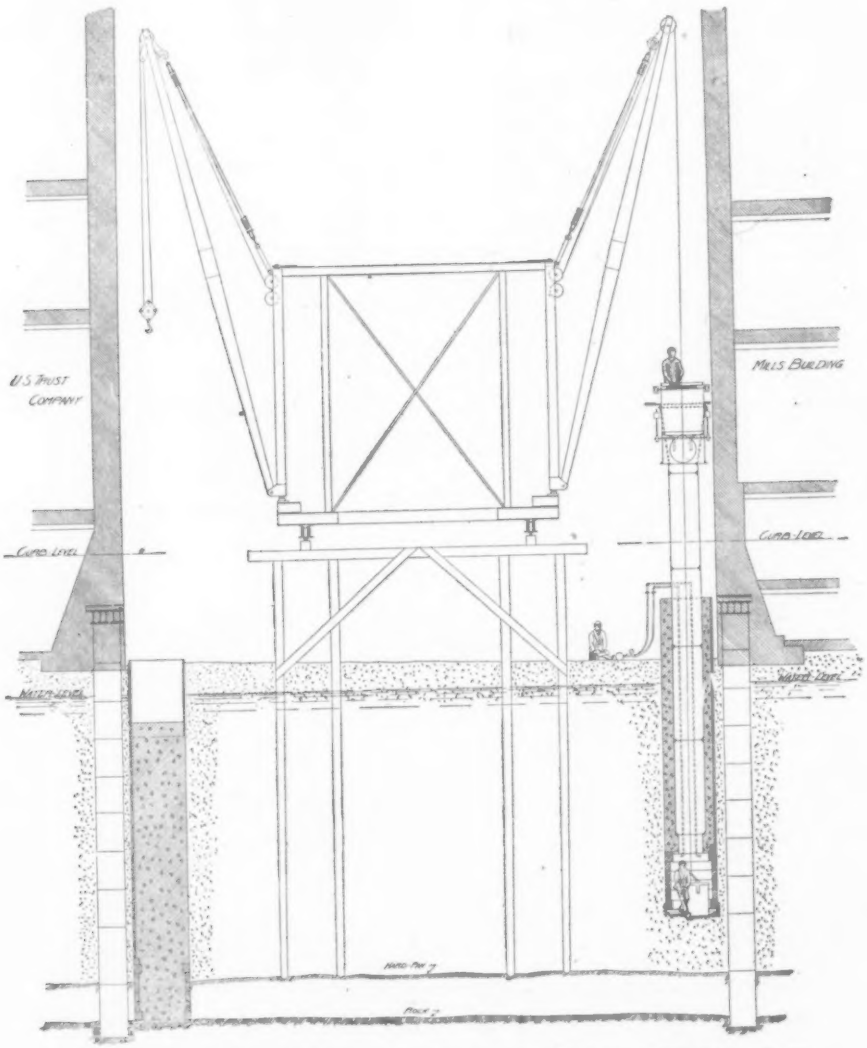
NEW BUILDING FOR THE TRUST COMPANY OF AMERICA, NEW YORK CITY.

5. Method of placing supporting piers for adjoining buildings.

as a passage for men and material in and out of the working chamber or caisson, was filled with concrete, thus making the pier one solid monolith of concrete from bed rock to the column base. This is shown on the left side of Fig. 6.

Referring again to the plan (Fig. 2) it is seen that these piers are sunk end to end with only twelve spaces between, and that the chain of piers around the entire site is made perfect by welding or bonding between the ends of each pier. This keeps the water in the surrounding soil from entering either the basement or subbasement of the building. The method was as follows:

Fig. 7 shows the end faces of the two adjacent piers. The semi-octagonal groove shown in the faces was formed at the time the cofferdam was put around the top of the caisson. The wooden false work served as a core, displacing the concrete from its top to its bottom from each end face of each pier. As soon as two adjacent caissons were ready to be welded or bonded the space bounded by the faces ABAB was excavated. At the same time the laborers would tear off the boards AA,



NEW BUILDING FOR THE TRUST COMPANY OF AMERICA, NEW YORK CITY.

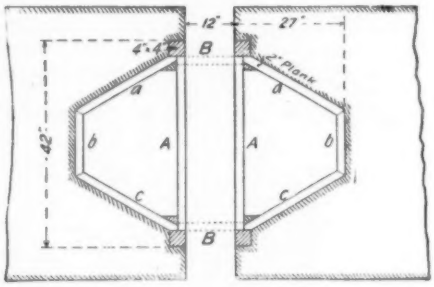
6. Traveling boom-derrick for handling materials.

saw them into the shorter lengths (BB) and nail them in position (BB) as shown in dotted lines. The space between the piers thus had become octagonal in shape and was carried down the few feet to the water level. The planks abc were removed.

A 4-foot length of steel cylinder, 30 inches in diameter, was placed in the opening and the space between it and the surrounding concrete and boards (BB) was filled in with concrete and made air-tight. An air lock was bolted to the top of this cylinder and the workmen excavated the material between A and B, tearing out all the lumber as they went down, and hoisting all the material to the surface, except what was needed for completing the boards (BB) clear down to the top of the caisson. All this octagonal well was then filled to the top with concrete under pressure and the bond was complete. When these connections between piers were completed on the north, east and west borders of the building site, it was only necessary to make the bond with the foundation piers of the Wall Street Exchange building on the south (put in by the same contractor to bed rock), in order to fully enclose the lot and prevent future flooding of the cellars, which reach to a depth of 40 feet below the water level. It will be seen from Fig. 2 that this was done without the expense of sinking a separate line of caissons on that side.

Another advantage in this solid wall type of bonded foundation construction is that the piers in the center of the lot can generally be sunk without the expense of the compressed air method, for there is little danger of any water seeping in from the outside and therefore weakening the other buildings.

At this stage of the job, the cellars can be safely dug, during which work the shoring of the neighboring building walls



NEW BUILDING FOR THE TRUST COMPANY OF AMERICA, NEW YORK CITY.

7. Detail of plan for bonding foundation piers.

was as shown in Fig. 8. Fig. 9 illustrates the appearance when all the substructure is completed and the cellar made ready for installing engines and boiler. The general class of work of which this job is merely one branch, is civil engineering in water or water-bearing strata, including mine shafts in wet or marshy lands, bridge piers, sea walls and tunnels. The Foundation Company, of 35 Nassau street, New York, are contractors for the work described above.

SHEET ASPHALT PAVEMENTS.

By H. C. Innes, Consulting and Constructing Engineer, Cincinnati, O.

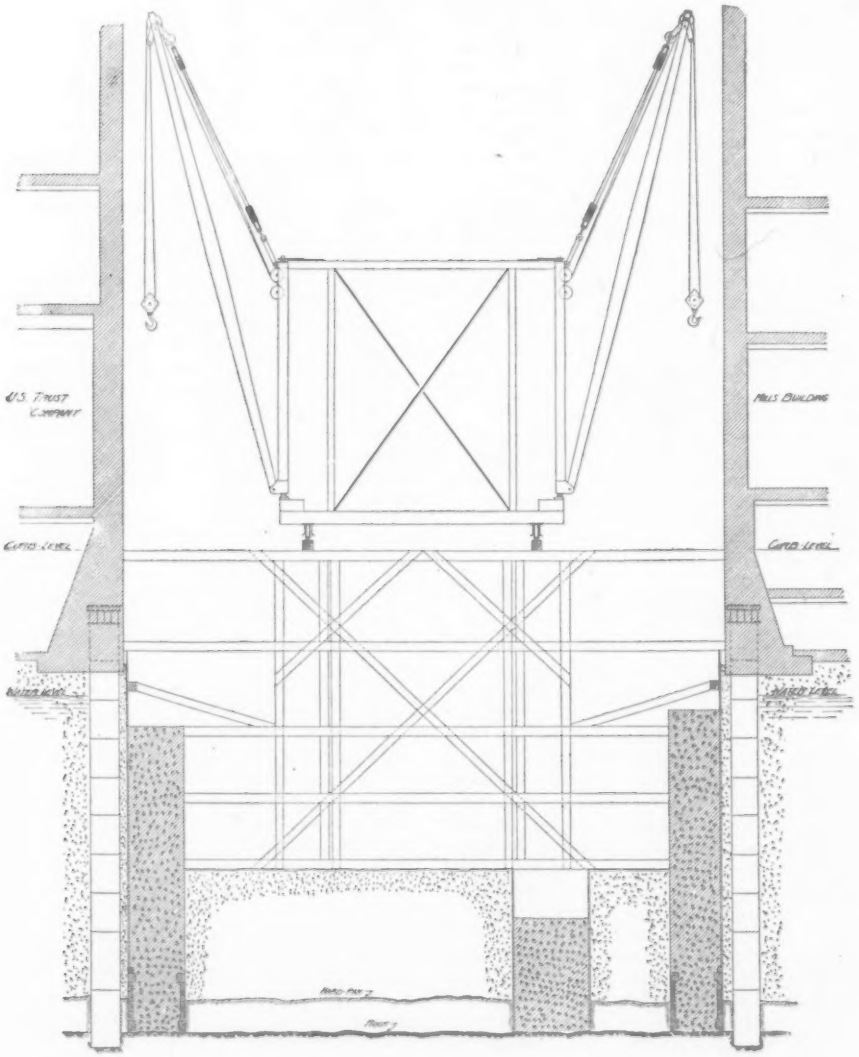
We are all more or less acquainted with the method of laying this material, as we notice the work progressing in our city streets. The work of the asphalt plant we see but seldom, owing to its location, which is situated some distance from our usual haunts. Formerly when asphalt work was laid it was necessary to erect a stationary local plant in the city. Now if the city does not warrant a local plant, any contracts obtained are executed by using a portable or railroad plant, which is self-contained on steel cars with ease of erection and dismantling ready for work or shipment as the case may be. In this way considerable is saved in property, rentals, taxes, watchmen, etc., permitting the smaller cities to enjoy asphalt streets at a reasonable cost. The stationary plant, however, is used in cities where work is plenty and where much work must be done to maintain the streets in proper condition.

In selecting the material, the best for the purpose should be secured. As sand is the great bulk of our asphalt streets, much care is exercised in securing a sand suitable. This is usually of angular grains, sharp, free from loam or foreign matter and of such gradation in size of grain as to give density. Sand varies in this particular very greatly. Sand of practically all the same grain gives a large per cent. of voids. It is the sand which has the least voids which gives the results desired. In the reduction of voids a saving is made in other material which must be supplied to fill these voids and better results are obtained. To determine the per cent. of voids in sand, the follow-

ing formula gives close results, the specific gravity of quartz being taken at 2.66:

Percentage of voids equals 266 minus weight of 100 c. c. m. of sand, divided by 2.66. This is obtained by using a thoroughly dry sand, a 100 c. c. m. flask, filling and tapping the flask to obtain as complete packing of sand as possible, obtaining weight and applying the formula. For instance, a sand weighing 191.2 gives 28.12 per cent. voids. These voids should be reduced to obtain good results.

It has been determined by analysis and experiment that the sand composition for securing the best results, giving the density required, shall be a graduated sand giving the least per cent. of voids. Such results are not always found, only very rarely in one sand. It is necessary to select two or more sands at times to secure the results needed and mix them as the sand is fed into the heating drums. The composition of sand to conform to a standard grading is as follows: Passing 200 sieve equals 00 per cent.; 100 sieve equals 17.0 per cent.: 80 sieve equals 17.0 per cent.; 50 sieve equals 30 per cent.;



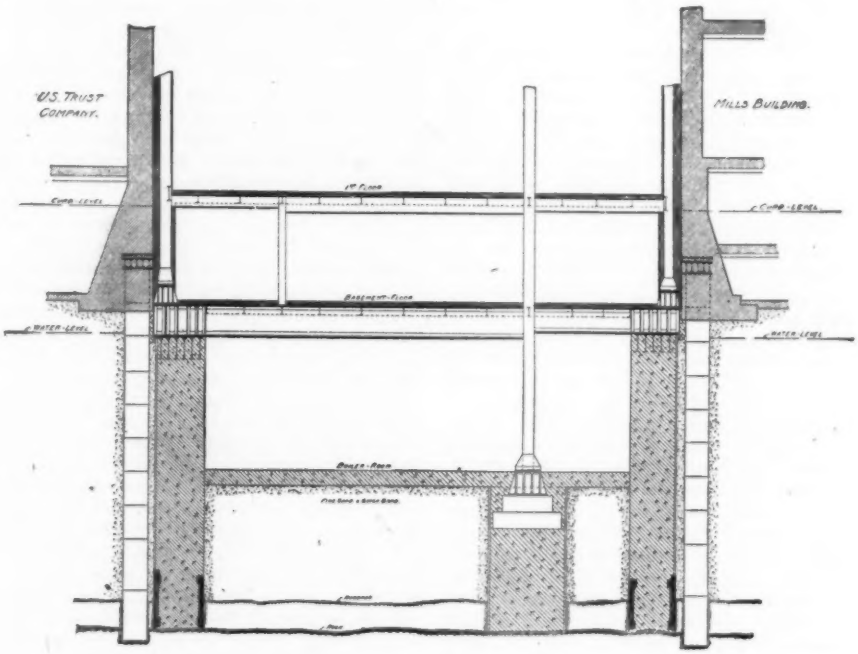
NEW BUILDING FOR THE TRUST COMPANY OF AMERICA, NEW YORK CITY.

8. Shoring of walls of adjoining buildings while excavating cellars.

40 sieve equals 13.0 per cent; 30 sieve equals 10.0 per cent.; 20 sieve equals 8.0 per cent.; 10 sieve equals 5.0 per cent.; total, 100. This grading has been found to give very good results, giving a low per cent. of voids to be filled by other ingredients. Other gradings are possible.

The standard mixture, which is made up of sand, limestone dust, natural or Portland cement, and asphaltic cement, for the best results has been determined as follows: Bitumen, 10.5 per cent.; other materials passing 200 sieve equals 13.0 per cent.; 100 sieve equals 13.0 per cent.; of the asphaltic cement. Hence a purer asphalt will lay a greater number of square yards of surface, depending upon its purity and quantity of bitumen, but in so doing a greater per cent. of fine mesh material, such as dust or cement, must be used to secure results as given in the standard mixture.

Refined asphalt must be converted into a condition suitable for coating the sand grains and other particles. In its refined asphalt condition it can not be used, therefore it is fluxed or softened with a certain amount of, usually, petroleum residuum.



NEW BUILDING FOR THE TRUST COMPANY OF AMERICA, NEW YORK CITY

9. The completed foundation, cellars and basement.

80 sieve equals 13.0 per cent.; 50 sieve equals 24.0 per cent.; 40 sieve equals 11.0 per cent.; 30 sieve equals 8.0 per cent.; 20 sieve equals 5.0 per cent.; 10 sieve equals 3.0 per cent. The limestone is ground so that approximately 80 per cent. passes a 200 screen. This is used to bring up the fine mesh material passing the 200 and 100 screen, to produce a well-balanced mixture. If a Trinidad asphalt is used, it contains some 25 per cent. of fine mineral matter. This serves for fine mesh material. If Bermudez or other asphalt containing no mineral matter, but nearly pure bitumen, is used, a larger per cent. of dust or cement must be used and at the same time a less amount by weight

An analysis of an acceptable residuum has specific gravity, Beaume, 20.5, actual 0.9330; flash point 458 degrees Fahr.; volatile in 7 hours 1.4 per cent., a quick flow at 78 degrees Fahr. Another sample taken of oil from another shipment gave specific gravity, Beaume, 19.8, actual at 78 degrees Fahr. 0.9372; flash point, 430 degrees Fahr.; volatile in 7 hours at 400 degrees Fahr. equals 3.8, residue quick flow at 78 degrees Fahr. This is also acceptable. I mention these to show that it is a difficult matter to secure petroleum residuum in different shipments which shall be identically the same. The analysis shows a variation, and in its use a larger or smaller per cent. of oil must be

used to secure a standard cement, based upon the degree of hardness you may wish to secure. The hardness of asphalt cement is determined by the penetration machine and gives a standard by which asphalt cements can be determined and compared for degree of hardness. The result is in millimeters, measured by a No. 2 cambric needle pressed with weight of 100 grammes for five seconds on a sample of asphalt cement at a temperature of 77 degrees Fahr.

Having obtained a standard cement, you can secure results desired by the proper proportioning of refined asphalt and oil. These are thoroughly mixed and agitated by compressed air or a mechanical agitator until a complete mixture of the ingredients has been secured. If a penetration machine is not a hand, a comparison can be had by forming small cylinders of the cement and the standard in molds, then placing these two cylinders side by side on a corrugated slide and subjecting all to heat, either on the dome of a boiler or in a steam-heated box fitted properly with coil of pipe. Presently the cylinders of asphalt will soften and flow down the slide. By a comparison of the lenghths of flow you can ascertain whether you need more residuum or more asphalt. If not enough oil, add and test again; if too much, agitate and test again, or add some refined asphalt to the tank.

Having determined the hardness of asphalt cement to be used in mixture for a street and obtained the proper sand grading, having a good supply of the necessary ingredients at hand, including asphalt, oil, dust, cement, binder stone, coarse, fine and medium sand, fuel, etc., you are ready to commence mixing. The standard or unit of measure is termed the batch and is equal to 9 cubic feet. It is also called the sand box. Care is taken to carefully weigh or measure all ingredients which enter into making up a batch. By a series of calculations, taking into account all items, such as analysis of the refined asphalt, the asphalt cement, the per cent. of various size grains of sand and dust, per cent. of voids to be filled and a number of other small items, you calculate a mixture suitable for the street you have under contract to pave. Natural conditions should always be considered, as, for instance the direction of a street—east and west, north and south; if it is shaded or will receive direct sun's rays; if it will receive heavy, medium or light travel; if travel is liable to be confined to narrow limits; if on a steep grade or flat area, and the class of travel to usually pass over the street. Having carefully considered these matters, calculated your mixture to be used as best suited, and reached a conclusion, you are ready to commence mixing your material and sending it out to the street.

The cold sand is fed into the elevator buckets, which convey it to the sand-heating drums. This sand may be a mixture of two or more sands. It is heated to 350 degrees Fahr. or 450 degrees Fahr. Passing through the drums, it is delivered to a second elevator, which carries it to a storage bin above the duplex mixer. The asphalt cement, being thoroughly mixed and agitated, is forced through pipes from the mixing tank by compressed air to a weighing bucket and so many pounds are placed in this bucket. The sand box, the unit of measure, rests on a platform scale and so many pounds of hot sand are weighed into the box, falling by gravity through chutes from the bin above. To this is added so many pounds of limestone dust or carbonate of lime, which is also placed in the sand box, and it may be required to add a certain number of pounds of Portland cement. If so, this is weighed and placed in the sand box. By means of a lever and movable gates at the bottom of the box, the mass slides into the mixer directly beneath and to the front. The sand, dust and cement are thoroughly mixed dry before the asphaltic cement is added. The entire mass is allowed to remain in the mixer 1½ to 2 minutes, when it is considered mixed. It is then dropped through sliding gates in the bottom of the mixer into a dump wagon below. Usually a load consists of five boxes, sometimes the wagons holding seven. A batch should cover an area, when raked and rolled, approximately of 7.2 square yards for 1½-inch surface, 6.2 for 2-inch, and 5.2 for 2½-inch pavement; or by weight of the mixture, ½-inch pavement per square yard, 50 pounds; 1 inch should equal 100 pounds; 1½ inch, 150 pounds, and 2 inch, 200 pounds per square yard.

The binder now usually employed instead of the cushion coat is applied directly upon the concrete surface. It consists of crushed stone, gravel or a mixture of both. The size of the stone is about that which will pass through a revolving screen of 1-inch opening down to ¼-inch, and at times some dust. The dust, however, adds largely to the amount of asphaltic cement required, but also if thoroughly mixed and coated adds to the strength. This is laid about 1 inch thick on the concrete and rolled. The stone is heated to about 250 degrees Fahr. and mixed with asphaltic cement consisting of 100 parts of refined asphalt to about 20 parts of petroleum residuum in a mixer having only half as many blades on the shafts as that used for the top mixture. If this binder is poor in asphaltic cement, teaming over it or too much rolling tends

to break it, so it is essential to secure a proper proportion of ingredients to give the results. This depends upon the mass of stone used and its size, considering whether some fine particles are permitted to enter. The binder should be very tough and strong, bright in color, showing the stones all well coated, and be of that size that it shows open work between the stone. Usually a batch of binder is 10 cubic feet or the 9-foot box heaped full, the amount of asphaltic cement varying from 40 to 60 pounds or more, depending upon the stone. The office of the binder is to form a backing for the top, and the openings formed by the stones permit the top to fill and be compressed into them, stiffening and binding these two layers together. This gives greater strength to the surface, permits of a richer mixture being used, and makes a pavement of greater life, preventing early disintegration and avoiding shifting into ridges and depressions. The mixture for the top surface being rich in bitumen, the tendency to crack in cold weather is therefore greatly reduced. In using the binder the tendency for the bottom of the top surface to take up moisture from the concrete is lessened, an important matter in the life of an asphalt surface. A batch of binder covers about 10 square yards of concrete 1 inch thick.

Some care and experience is required to rake the asphalt surface to good lines, to secure the proper thickness and avoid low places. These low places can be avoided, largely by careful observation as the surface of the 2½-ton roller goes over it the first time. If any places are low or high, the roller will show it by the compression. A careful raker can take out such places. If the surface is irregular or slightly uneven, this can be to a large extent corrected by straight, cross and diagonal rolling while the material is warm. If the asphalt surface extends to the curbing, the gutter is painted with asphaltic cement or pitch, heated by smoothing irons. This is done to give an excess of asphaltum to this part of the pavement, giving greater density, filling up any voids, and to increase the life of the pavement at this point. The surface is swept with a cement, usually a natural cement, and final rolling is done with a 10-ton asphalt roller to secure as great a compression as possible.

The street is blocked to travel so long as is required for the unnatural heat to pass off and pavement to cool or become equal to the temperature of the air. It is then opened to travel and receives its best compression from the wagon wheels and horses' shoes. This compacting continues until the mixture has reached its ultimate compression, until some of the essential oils have passed off by heat, or oxidation takes place and the pavement ceases to show such marks as originally. When this point is reached, then abrasion commences and each year seems to show the pavement as being thinner, due somewhat to compression, however.

Disintegration takes place in spots, due to various causes. A low spot holding water assists greatly, dissolving soluble salts in the mixture. The dropping of a wheel from a high to a lower level pounds this spot, and foreign matter permitted to lie on the pavement for any time without removing makes such a high spot.

Certain kinds of marks made by the horses' shoes on a new pavement indicate whether the pavement will give good results. The sound made by a horse as his foot strikes the pavement in running, cutting a morning joint at times, or observing the fine edge at the joint cloth where rolled the night before, noticing the condition of the surface after a rain, seeing how the material acts under the roller, noticing how it rakes or pulls during the laying, feeling it between the fingers, rolling and balling it, and pressing it out between the fingers, and many other ways bespeak much to one experienced in the composition and laying of an asphalt surface.

During the day's run of a mixture frequent sand tests are made by collecting samples of hot sand and sieving it to ascertain how the grading runs. Tests for hardness or consistency of the asphaltic cement are also made and records fully kept. Pat tests are made of the resultant mixture. These are made by placing on a certain grade of manilla paper a portion of the mixture, folding the paper and striking a certain number of blows with a flat block. Opening the paper you note the discoloration, see if it is clear, and a regular stain. From this test much is shown to one experienced.

Complete daily report records are kept at the plant regarding material, labor, costs, etc., also on the street the yardage laid, material received, cost of laying, hauling, and a complete record of results and conditions.

The mixture of today contains from 20 to 35 per cent. more asphaltic cement than the surface laid ten years ago.

The analyses of asphalts differ greatly one from the other, and there are so many different grades and kinds from various locations, that each requires a separate handling and different quantity to produce required results. If thoroughly understood and correctly manipulated, good pavements can be obtained from many of the various brands. Some, however, are unsuited for use in a paving mixture, but have a value in other branches of manu-

facturing. Asphalt chemically is divided into petrolene, the sticky, viscous, life-giving substance, and asphaltene, the hard substance, giving base and bulk. The petrolene can be converted into asphaltene by heating, but asphaltene can not be changed into petrolene. The percentages of these differ greatly in the various asphalts, as do also the amounts of bitumen, mineral matter, organic and inorganic matter contained in the refined asphalts from different locations.

Care must be given to the melting of the refined asphalt and properly mixing of the oil, as will be noticed from the above statement that constant or too great a heat tends to harden and possibly burn the asphalt. Constant agitation is essential, as is also watching carefully the temperature of the asphaltic cement. At times the sand may become heated too high. This has a tendency likewise to injure the asphalt when added.

Mixtures vary considerably, depending upon the sand and asphalt used. One mixture may show asphaltic cement, 155 pounds; sand, 783 pounds; dust, 80 pounds; or 15.2 per cent. asphalt cement, 76.9 per cent. sand, and 7.8 per cent. carbonate of lime. In another mixture used in the same city as the above, Portland cement was substituted for part of the dust. giving 783 pounds sand, 50 pounds Portland cement, 30 pounds dust, and 160 pounds asphaltic cement.

The success of the pavement depends largely upon proper care in the handling of the materials, the securing of the correct well-balanced mixture, proper consistency of the asphaltic cement, the manner of mixing and laying. The greatest of care should at all times be exercised, with a knowledge of the ingredients and a complete study of the conditions existing, to prepare a suitable mixture to meet such requirements. We should not always depend entirely upon the material to give results we so much desire, but good, suitable material, aided by experience, knowledge and care in manipulating same, will give better results, and the material should have this consideration from us in the work. When completed, an asphalt surface presents a very pleasing appearance, and if proper care in keeping it clean is used, the street will give good results, if properly laid and suitable mixture materials are used. It has a number of advantages which speak in its behalf. At times you will find adverse opinions. These may be due to improper work and material used.

A SEWER TUNNEL IN SYRACUSE, N. Y.

City Engineer Frank J. Schnauber, of Syracuse, N. Y., is bringing to completion an interesting piece of sewer work. It disposes of the discharge from the separate sewer system through a tunnel sewer and will provide for the sewage of an area of nearly 600 acres. The sewage and storm water will be concentrated at a given point, but this tunnel sewer will only dispose of the sewage or dry weather flow, carrying it from the concentration point or upper end of the tunnel through a 33-inch brick sewer, part in an open cut and part in the tunnel, connecting with one of the main sewers in the general system of the city, which has its outlet in Onondaga Creek. The storm water will be carried from the concentration point through a 66-inch brick sewer with an outlet to Ley Creek.

The tunnel sewer is entirely through private property, with the exception of street crossings. It is 4,717 feet in length.

In order to provide for the future care of the sewer the tunnel openings have been made permanent by being provided with manholes.

After some delay the tunnel work was carried on simultaneously in the four sections or headings, and it was continued in this manner until its completion.

The dimensions of tunnel excavation were 7 feet 9 inches by 5 feet 10 inches, the material following very closely that shown by borings.

All timber used in the tunnel was beech, consisting of 6x6-inch frames, spaced about 5 feet centers. The cap and sill were 5 feet, 6 inches long, and uprights 6 feet 6 inches long, with the corners temporarily strapped with angle iron, which was withdrawn after the overhead and side bridging was advanced two frames. On top of the frames at either corner were 2x4x6-inch blocks, on which were placed 2-inch planks, thus leaving a 2-inch space for driving the top bridging. Owing to the fact that each overhead sheeting or top bridging offered a pressure to the plank placed on the blocks, the edges of the plank were beveled and the top bridging pointed to allow the top bridging to enter the space, and after once entered, the driving progressed satisfactorily. The beech timber, on account of its toughness, did not splinter or brush, as was the case with most available material.

In the tunnel was an 18-inch gauge

track, carried along as the tunnel progressed, on which was run a flat wooden truck or platform car, sometimes called a "go-devil," on which were placed buckets. When a bucket was filled a man pushed it to the mouth of the tunnel, where it was raised with a trenching machine and conveyed to the dumping ground. The excess of material was used to raise the grade of low ground contiguous to the tunnel work, which made very short hauls.

The tunnel was lighted by electricity furnished by the local lighting company.

The working force consisted of three 8-hour shifts of four laborers and a foreman. The sewer construction was the same as in the open cut, or 33-inch 2-ring brick sewer, laid on a cradle, all the space below the springing line being filled with 1-3-7 natural cement concrete. From the springing line of the sewer to the roof of the tunnel was backfilled with earth. The progress made in the heading averaged 3.4 feet per 8-hour shift. The excavation was 45.18 cubic feet per foot of tunnel, or 5.69 yards per shift. To break this down required about 12 sticks of 60 per cent. dynamite. About 200 feet of lumber per shift were used.

The disposition of the labor was as follows: Engineer, who also repaired tools during his leisure time while the other laborers were drilling; one handy man on top, who acted as conductor on the car, leveled the dump, and assisted in cutting frames; two sheeters, two muckers, both sheeters and muckers working at drilling, and one foreman.

The Oak Street shaft was the deepest, being 60 feet from the surface of the ground to the subgrade. The dimensions were 16 feet 4 inches by 8 feet, and the borings at this point indicated 40 feet of red clay, followed by 14 feet of clay and boulders, the balance being clay rock. The clay was hard, but decomposed upon exposure, necessitating the sheeting of sides, or lagging. The shaft was divided into three compartments or openings. The middle opening was 6 feet 4 inches in the clear and the end openings 3 feet 6 inches in the clear. The middle opening was used for hoisting the buckets, one end opening for the pump way and the other for a ladder way.

The machine used at the shaft consisted of a platform car 13 feet long by 7 feet wide, mounted on trucks of standard gauge. There was a hole in the platform 4 feet 10 inches by 6 feet, through which the buckets were hoisted. Over this hole was an angle iron frame, at the top of which was the supporting mechanism or hoisting device for raising and lowering the buckets. The power to operate the hoist and move the car was developed by a 4-cylinder, 4-cycle gasoline engine of 30 h. p., acting through a 2-way friction clutch; one way this threw in a single drum and operated a cable which hoisted or lowered the buckets; the other way it threw in gears connected to the sprocket in car wheel, causing the car to move controlled by the marine reversing device. Between the bucket opening and one end of the car was a space of 2½ feet, where the bucket operator stood. At the other end of the car was located the engine and drum, and the engineer was stationed near the opening, where he could operate the levers and at the same time have a clear view of the shaft below, being ready at once to stop the bucket if necessary.
forward or backward, the direction being

The manhole built at the shaft was 5 feet in diameter with a 1-foot wall of brickwork to within 20 feet of surface, when the brickwork was reduced to an 8-inch wall and 5 feet from the surface was drawn in from 5 feet to 2 feet in diameter for the iron cover.

The contract prices for this work were as follows: Earth excavation in open cut and disposal of material by removal or refilling trenches, 30 cents per cubic yard; rock excavation in open cut and disposal of material by removal or refilling of trenches, $1 per cubic yard; all masonry, including centers and forms and all incidental work, $3.50 per cubic yard; first-class Portland cement concrete, $4 per cubic yard; second-class American cement concrete, $2.75 per cubic yard. All excavation, including rock, to subgrade of sewer in tunnel and shaft, and disposal of material, $6 per cubic yard; backfilling in tunnel and shaft, $1 per cubic yard.

EDITORIAL COMMENT

Building Regulations for Concrete.

South American Trade for the United States.

BUILDING REGULATIONS FOR CONCRETE.

The inquiry for information about building regulations governing the use of concrete blocks, which will be found in the Question Department this month, is but one of many inquiries of the same kind regarding the use of concrete plain and reinforced and in block form. MUNICIPAL ENGINEERING is printing from month to month the building regulations regarding the use of this material, and a perusal of them will show that there is even less system in the preparation of these regulations than of those regarding brick work. This is partly because no two cities have attacked the problem from the same point. Some have followed the methods heretofore adopted regarding brick work. Others have taken up the problem as a new one. Some have begun with the mixture of the concrete and prescribed the materials and their proportions. Some have preferred to test the blocks. Some are satisfied with fixing the thickness of walls of various heights with modifications for long walls and for the parts bearing girders. Out of all this it may be possible to choose some method which will approximate the best for all cases and to adopt this for general use, although it may not be always the best for the particular circumstances.

A comparison of the requirements of the building laws in various cities is interesting for the showing of differences. In the case of stone these differences may be explained by the differences in the qualities obtainable in the various cities. The same explanation is applicable to some extent regarding brick work, but, apparently, the question of workmanship also enters into the problem to complicate it. In the case of hard-burned brick, laid in natural cement mortar, for example, where the workmanship is presumably the best obtainable, the Eastern cities, Boston, New York and Philadelphia, allow 15 tons pressure per square foot, while Western cities, Buffalo, Chicago and Denver, allow only 9 tons. For hard-burned brick in lime mortar, the Eastern cities named allow 8 tons, Denver allows 8 tons, Chicago 6½, and Buffalo 6 tons per square foot. The 15 tons is about one twenty-fifth to one fortieth of the crushing strength of a hard-burned brick, or perhaps one-fifth the strength of a brick pier the height of a single story. Soft brick may be less than one-tenth the strength of hard-burned brick, so that if the ordinance is not well drawn or the inspection is careless, the factor of safety may be small. It is common, also, to prescribe the thickness of brick walls, so that the specification of load on wall is of no special value to the ordinary builder, who must make his wall of the given thickness whatever his method of construction or quality of material. Where heavy loads are to be carried the specification regarding loading is of direct application.

Can anything be done to improve this ordinance requirement when applied to concrete blocks or to plain concrete? There is as great a difference between a poor concrete or mortar block and a first-class concrete block as there is between a soft brick and a first-class pressed brick, and, within certain inner limits, it may not be so easy to separate the good from the not so good by inspection. For this reason tests of a percentage of the blocks may not give as satisfactory a check on the quality of the blocks as in the case of brick.

For reinforced concrete floors, tests are frequently required under loads bearing a certain relation to the breaking load, the deflection, cracking, and other phenomena being observed and the decision regarding the sufficiency of the floor being made accordingly. The testing of walls is ordinarily not so readily done, nor, for other reasons, some of which will be stated later, will it really show what is wanted, the stability of the blocks in place.

Another proposition which has been made is the inspection of the manufacture of the blocks. This is in line with the practice of some in the inspection of steel, the steel being tested at the mills by competent disinterested persons, who keep an eye on the manufacture to guide them in the application of their tests. There is a tendency in large contracts for cement toward the same method of procedure. Cement, however, is liable to deterioration after it leaves the mill and to abuse in its combination with the other materials of concrete, so that the factory inspection of cement is not likely to become popular. Concrete blocks and the factory-

made plain and reinforced concrete building materials of various sorts which are finding their way on the market are more nearly in the class with steel, and, assuming proper handling in delivery, blocks which pass inspection at a factory would pass inspection at the building. For such manufactured concrete building materials, therefore, inspection at the factory has its advantages. It should be coupled with reports showing the receipt of the blocks at their final destination if within the jurisdiction of the same building inspector. Perhaps the simplest method of controlling this inspection would be the licensing of manufacturers of portable cement products under regulations which would require certificates with all shipments of blocks, for presentation on demand to the deputy city building inspector in whose district the building in which the blocks are to be used is located, approval of formula and methods of manufacture by the chief building inspector and inspection by him or his authorized representative of the materials and methods of manufacture whenever he desires.

Concrete walls and reinforced concrete structures made in place are practically in the same class with brick walls, except that the materials as well as the workmanship require constant inspection by competent and honest men to secure the required results. The walls are subject to the same neglect to which the brick walls are subject under existing practice in city building inspection departments, and improvement in results can be obtained in the same way in both cases. Perhaps the methods of testing floors, columns, beams, etc., of reinforced concrete by loading them are the best attainable under present conditions.

The above discussion is very fragmentary and has reference only to the question of strength, but it may be suggestive and may lead to further discussion, out of which something of value may be obtained.

Three is, for example, the question of the insulating action of a wall. Brick walls must frequently be made thicker than the demands of strength require, that there may be sufficient resistance to fire. The insulating qualities of concrete walls, particularly of concrete block walls, are not yet understood and building regulations must be left subject to change in this respect until the experiments of the committee of the National Fire Protection Association and others have given data enough to warrant at least preliminary conclusions.

Other considerations will be taken up later and contributions to the discussion are invited from our readers.

SOUTH AMERICAN TRADE FOR THE UNITED STATES.

The party which visited South America with Secretary Root has brought back reports of the feeling in trade circles toward the United States and the prospects of trade, which are very encouraging so far as prospects are concerned, the only discouraging feature being the failure of American manufacturers, with a few exceptions, to meet the trade conditions. Mr. G. C. Marsh, of Chicago, has recently returned from a South American trip to determine the opportunities for trade in construction machinery and he brings similar reports.

All concur in saying that the American treatment of export trade is outrageous. The English and German manufacturers have branch houses or reliable agents who look after their interests and handle the trade the same as they do their trade at home. The interests of their customers are looked after, credits are handled the same as at home, and in all things the South American trade has the same careful treatment that is given the home trade. Some agricultural implement manufacturers in the United States have seen the advantage of catering to the trade and their returns are very large. Some of them are obliged to do business through English or German agents. Mr. W. J. Johnston, in a recent article, says that one German house in Buenos Aires, founded to sell only German agricultural ma- for "American" goods so great, on achinery, hardware, etc., found the demand count of the superior adaptability to the local conditions, that most of the wares now sold by it are from the United States. A single remittance to an American agricultural implement house was one million dollars. Mr. Marsh says there is also a large sale for plumbers' supplies from this country.

Most American houses, however, insist on part cash with the order, and have been very negligent in filling orders, postponing them until after the home trade is taken care of and then sending what they have not, for one reason or another, been able to sell at home. Shipments are not well packed, and since the whole payment for the shipment is demanded practically with the delivery of the goods to steamer dock in New York, the rebates for damages cause much friction if they are obtainable. That there is any export trade in most articles of American manufacture is due to the demand for them notwithstanding the difficulties in getting them, rather than to any desire of the manufacturer to sell. Mr. Marsh found that the American machinery for contractors is suitable for the trade and that there will

be a great demand for it as soon as the proper arrangements for local representatives and for proper treatment of customers is made.

The treatment of the export cement trade has already been commented upon by MUNICIPAL ENGINEERING. That this trade is only used as an outlet for surplus and is not cultivated is suggested by the fact that in 1904 we exported 774,940 barrels of cement, in 1905, 1,016,236 barrels, but in 1906 the demand at home was so great that the exports were reduced to 583,299 barrels. In 1905 the average valuation was $1.36 a barrel and the foreigner had to pay $1.62 a barrel in 1906, showing that he must have it, whatever the price.

THE QUESTION DEPARTMENT

SPECIFICATIONS FOR CONCRETE SEWER PIPE.

I would like to get a set of specifications for cement sewer pipe at an early date. Could you refer me to any such or send me copy of same, 8 to 30-inch sizes? Would you recommend a uniform concrete mixture for the pipe, as 1-3 or a two-mixture pipe? E. K. M.,
Pierre, S. D.

Folwell's "Sewerage" ($3) gives a short specification for cement sewer pipe, which is as follows:

"All pipe and specials, unless otherwise specified, shall be of the best quality of cement sewer pipe of the hub and spigot pattern; it shall have a thickness not less than ⅝ inch plus 1-12 the diameter of the pipe. Each hub shall be of sufficient diameter to receive to its full depth the spigot end of the next following pipe or special without any chipping whatever of either, and also leave a space of not less than ½ inch all around for the cement mortar joint; it shall also have a depth from its face to the shoulder of the pipe on which it is molded at least 1 inch greater than the thickness of said pipe. All pipe shall be in 3-foot lengths and in section shall truly correspond to their nominal shapes. Each pipe shall have a flat base making exact right angles with the vertical axis of the pipe and with a width equal to two-thirds the interior horizontal diameter of said pipe. The inside surface of the pipe shall be smooth and true, and no pipe shall be patched with cement or otherwise. Any pipe will be rejected which is not of fine, sound and dense material throughout, or which shows the use of poor materials or imperfect mixing or compacting."

In case beveled joint pipe is specified, Mr. Folwell requires that "The bevel on each pipe shall be at least 25 per cent. longer than the thickness of said pipe, with an even and firm edge.

These specifications were written before the days of reinforced concrete pipe, and they also do not consider the question of the mixture of which the pipe must be made, soundness and density being the requirements, without defining the methods by which these shall be secured.

A list of articles on concrete sewers, which have appeared in MUNICIPAL ENGINEERING, will be found in vol. xxxi, p. 398. The one on the Indianapolis concrete sewer in vol. xxv, p. 182, and that on the Wilmington sewer, vol. xxvii, p. 248, give specifications for concrete and reinforced concrete sewers constructed in place. The article in vol. xxii, p. 19, gives an abstract of the specifications for concrete sewers in use in Washington.

As regards the sizes of materials to be used, the requirement of density must be met. This will be most nearly obtained by using a mixture of various sizes from fine to coarse, so graded as to give the minimum of voids. Proportions of 1 to 3 of cement and sand may give a dense mixture, but are likely not to give as dense a mixture as a larger proportion of sand and gravel of selected sizes. The general principle should be to reduce the voids to a commercially practical minimum and then use a little more cement than is necessary to fill them.

THE USE OF WATER PROOFING IN CONCRETE.

In your February number, page 88, you reply to a party interested in the manufacture of concrete blocks, and we infer from your reply that you rather discourage the use of waterproofing compounds in connection with manufacturing blocks. We do not wish to criticise your editor for such replies, but we are anxious that he understand the following, which can be verified by making actual tests of the waterproof compound we are manufacturing:

You will acknowledge that, to make a

block which is anywhere near waterproof, concrete mixture must be very rich in cement. This makes blocks cost, usually, more than can be obtained for them on the market. We certainly approve your suggestions to all interested blockmakers that they make good blocks and not poor ones, but on actual tests obtained in our laboratory we have found that concrete blocks made with cement to which 1 per cent. of our compound has been added, with 5 parts sand and gravel, resist water better than blocks made in proportions of 1 to 2 without the compound. We also call your attention to an absorption test on page 19 of the enclosed circular, as well as a house built for our manager, illustrated on the back cover of enclosed pamphlet. In making the blocks used in this building in the proportions shown on page 19, our superintendent was careful that the concrete was thoroughly mixed and that plenty of water was used in the mixture. Also that the blocks were thoroughly tamped. P. B. BEERY,
Assistant Manager Portland Cement Co.,
Sandusky, O.

The table referred to given herewith:

CONCRETE BLOCKS, WATER ABSORPTION.
Effect of Medusa Water-Proof Compound.

Amount Water-Proof Compound, Per Cent. of Weight of Cement.	Water Absorbed, Per Cent. of Total Weight.				
	Weight Dry lbs	1 hr.	2 hrs.	3 hrs.	4 hrs.	24 hrs.
No. 1—Water-Proof Compound 0 per cent.	60.62	4.38	4.84	4.94	4.99	5.16
No. 2—Water-Proof Compound 1 per cent.	62.34	.44	.44	.48	.54	.70
No. 3—Water-Proof Compound 2 per cent.	62.06	.09	.09	.14	.14	.30

It must be understood that the above test is much more severe than the heaviest rain storm.

Hollow blocks 8x9x16 inches, of Medusa Cement 125, Sand and Gravel 600, equal 1 to 4 and 4-5, by weight, with and without Medusa Water-Proof Compound. Made July, 1905; exposed to weather 9 months; then allowed to become air-dry in factory; placed in water 2 in. deep, and weighed at 1, 2, 3, 4 and 24 hrs.

The recipe referred to is one used by W. C. Hawley, and the Olean soap is probably a local hard laundry soap. It is evidently made into a temporarily soft soap or solution by boiling ¾ pound of soap in a gallon of water. Any similar soap should be equally good.

This is the so-called Sylvester's process and is intended to fill the pores of the stone for some distance from the surface. The care with which the work is done and the thoroughness and number of applications will affect the success of the operation. It should be possible practically to prevent the absorption of water by filling the pores of the stone in the manner described. Past experience with this process on stone and brick walls indicates that it will be necessary to make additional applications, possibly as frequently as once in four or five years. Climatic conditions cause much variation in the durability of the applications.

If our correspondent will read the answer again, he will see that the definite statement is made that "undoubtedly, . . . and waterproofing aid in the solution of the problem and may be used to advantage, but only as auxiliaries to good materials and enough cement well put together and cured." It seems to the writer as though this meets the requirements of the above letter exactly. The material mentioned is quite different from other waterproofing materials and requires different treatment, but all kinds can come in under the statement, and the use of waterproofing is distinctly approved.

WATERPROOFING FOR BLOCK WALLS.

I see in your "Handbook for Cement Users," page 345, that ¾ pound Olean soap to the gallon of water, and ½ pound alum to 4 gallons of water, will waterproof cement.

I have in Florida quite a large building of concrete hollow blocks, made by dry process, which absorbs water badly.

Will this preparation applied as you therein direct be effective in waterproofing these walls?

What is this Olean soap and where can it be obtained?

Procter & Gamble, Cincinnati, make a soap they call Oleine. Is it the same, only spelled differently.

Top of page 346 you speak of applying "soft soap" again. The Procter & Gamble soap comes in bars, hence is not a soft soap in the sense in which that term is used to designate a soda or potash soap. What do you mean by the term if it is not naturally a potash soap?

Will you kindly answer at once, as rains will probably begin ere long and interfere with work of putting it on properly.

Will it endure the sun and winds without losing its waterproofing qualities?

E. E. W., Eaton, O.

BUILDING REGULATIONS FOR CONCRETE BLOCKS.

Refering to the concrete block industry. There is to be a fight made on this industry here by the brick men. We have succeeded in getting the local newspapers on the side of the concrete men, and as you are considered an authority on concrete construction, we would thank you to send us all the literature you have as to the comparative strength with brick, so that the newspapers can give publicity to the same.

The law has been that we could build a 10-inch concrete wall, but now they desire to make it 12 inches, even for a 1-story house; but it mostly applies to 2 stories.

If you could give us the crushing strength in comparison with brick and your authority for the same, also any building laws that you know of which have been adopted favorable to concrete, we would appreciate it. Please give us the relative strength of same size concrete and brick wall. Also take for instance a 12-inch brick wall and a 10-inch concrete wall.

We hope to hear from you by return mail, as we have succeeded in getting the city council to postpone action till we hear from you.

NEWSOME CRUSHED STONE & QUARRY CO., Nashville, Tenn.

The new building ordinance in San Francisco fixes 450 pounds per square inch as the safe compressive strength of plain concrete in walls, which is increased to 500 pounds in reinforced concrete and 700 pounds in specially wound columns. See MUNICIPAL ENGINEERING, vol. xxxii, p. 25. Pittsfield, Mass., fixes 500 pounds per square inch as the maximum in beams and 416 pounds in piers or columns, made of 1 part Portland cement and 6 parts of graded stone and sand. See vol. xxxii, p. 31.

Philadelphia, vol. xxix, p. 356; Newark, vol. xxix, p. 358; Minneapolis, vol. xxix, p. 442, require crushing strength of concrete blocks used in walls, varying from 700 pounds minimum and 1,000 pounds average in the first to 2,000 pounds per square inch in the last named, showing great variation. The allowable stress in walls would probably be about the same as in San Francisco.

Other cities prescribe thickness of walls. Thus Grand Rapids, vol. xxxi, p. 473, prescribes for concrete walls, one story, 10 inches thickness; two-story house, 10 and 8 inches; three-story, 12, 10 and 8 inches; four-story, 14, 12, 10 and 8 inches for hollow concrete block walls, which must be made solid under girders bearing on the walls. Plain concrete walls seem to be 10 inches thick for one story and each additional story, added at the bottom, 2 inches thicker. The basement walls are 16 inches thick for one, two or three-story buildings, and thereafter follow the above rule. The Indianapolis ordinance requires brick walls to be 12 inches thick for first and second stories, 16 for third and fourth stories, added below, 20 for fifth, sixth and seventh stories, added below, 24 for the next three stories, and 28 for the next two stories, added below, thus requiring 2 inches more on the top story than the Grand Rapids concrete walls, with varying differences on other stories. The Indianapolis ordinance makes no specification for concrete walls, simply stating that they may be used. Chicago says that hollow concrete blocks of the full thickness of a 10-inch wall may be used wherever 8-inch walls are called for in the ordinance, and that under frame cottages and in one and two-story Class 3 and Class 6 buildings, the 10-inch blocks can be used where 12-inch walls are called for. See vol. xxix, p. 344.

As to relative strength of brick and concrete, an article in vol. xxvi, p. 426, gives 1850 pounds per square inch as crushing strength of soft building brick and 3,370 of common building brick. Brick piers 12 inches square and 1 foot 4 inches to 10 feet high are but from 6 to 27 per cent. as strong as the flat bricks, which if tested whole in this position crush under 7,000 to 17,000 pounds per square inch. The piers will crush under loads of 1,400 to 2,500 pounds per square inch. Chicago architects allow safe loads of 140 pounds per square inch on best brick masonry and 70 pounds on ordinary brick work in lime mortar, as compared with the 450 pounds allowed concrete in San Francisco. It is probable, however, that the best brick work, laid in Portland cement mortar, is equal to the San Francisco requirement for Portland cement concrete, and that ordinary brick masonry could safely carry 250 pounds per square inch.

See MUNICIPAL ENGINEERING, vol. xxx, p. 283, for some results of tests of concrete blocks and for other references.

Tests at the Case School of Applied Sciences, Cleveland, O., showed 1,500 to 2,000 pounds per square inch crushing strength on blocks 10 weeks old, and over 2,500 pounds on blocks 22 months old. Tests at the Watertown Arsenal, Massachusetts, see vol. xxix, p. 223, showed 2,370 pounds per square inch for mortar blocks, to cement to 4 sand, 9 months old, and 3,060 pounds for 1 cement, 3 sand and 5 broken stone, 12 months old, per square inch of concrete. Poor blocks will not give good results, but good blocks will give uniformly high results on testing.

See also Baker's "Masonry Construction" ($5) for other tests of concrete and brick masonry, which show the same superiority of concrete.

The effort should be not to restrict the application of concrete, but to insure its proper manufacture. Brick can be inspected before laying, but concrete must be inspected while it is being mixed and deposited. The building ordinance should therefore provide for the fullest use of concrete and at the same time for its right inspection. There is more difference between poor and good brick work than between poor and good concrete as ordinarily constructed. Poor concrete will be bad however small the load put on it, but good concrete is unapproachable in strength by other common building materials. It is evidently not good business policy to prevent the use of concrete or to restrict its use. It is necessary, however, to supervise its construction closely. Concrete blocks should receive inspection

also, and they may be tested as readily as brick, except for the size of the specimens.

MANUFACTURE OF CONCRETE BLOCKS.

I have just read your article in the March MUNICIPAL ENGINEERING on "The Ideal Concrete Block Made Practical." I am planning to erect a plant in the spring in Bloomington, Ill., and to instal a post, tile, brick and shingle machine, but hesitate about a block machine, for I have always felt that this branch of concrete construction was still in a crude state. It stands to reason that a mixture of 1 part cement to from 5 to 7 parts sand, and molded dry, is not "concrete," and to overcome its porosity by painting with some compound was not, in my judgment, meeting the difficulty in the right way. It merely gets around it, but without overcoming it.

Your very interesting article, above referred to, is the first one I have ever read which suggests a practical solution of the problem. I am new in the business, consequently I have been reading up on the subject as thoroughly as possible, and I am going to follow out your suggestions to see if I can not produce the "ideal" block.

With this in view I am going to ask you if it would be possible to mold a 1-3-7 mixture (the aggregate carefully graded as you outline) in a comparatively dry state, so it could be removed from the molds to set, in the manner of the present sand-cement block, and if this was done, would the block absorb enough additional moisture to make a waterproof block, as would be the case if it were cast wet? I understand that there is a machine on the market which enables one to use concrete, but I have not seen it.

I am planning a drying or curing room in conjunction with my plant, with enough tracks to hold the output of the plant for from two to three days. I will keep the atmosphere in this room heavily saturated with water by means of a sand floor always kept moist and also exhaust steam. Now will this plan give the blocks, etc., sufficient moisture to effect proper crystallization without the aid of direct application by hose? And would it be effected in less time than by sprinkling? I want to avoid depending upon a workman to do this part of the work, if possible.

I have just sent for the back numbers of MUNICIPAL ENGINEERING for the year 1906, hoping to find some more articles by you. I feel that I have been put on the "right track" by reading this present article. D. E., Arlington, Ind.

This letter was written to Mr. Louis H. Gibson and is replied to in this department for the benefit of others. The block can be made in the usual block machine, putting in the maximum amount of water possible for the block to stand up after it has been taken out of the form. This amount must be determined by experiment, and will vary slightly on account of variations of moisture of materials, weather conditions, temperature and moisture of factory, etc. The foreman and the workmen, if competent, will soon learn the appearance which the wet mixture should have and will almost automatically vary the amount of water to correspond. Curing by exhaust steam will be the best way of treating such blocks. They will thus be saved drying out and will cure better. Try variations each way from the proportions of materials mentioned until the densest mixture is found.

THE BEST CONCRETE BLOCK MACHINE.

I have the "Handbook for Cement Users," by Charles Carroll Brown. I want information about the best concrete machine for all kinds of concrete blocks. I am a cement user and learned a great deal by reading the handbook and MUNICIPAL ENGINEERING. I will be pleased to get information of the best machine on high-grade cement work of all kinds.
J. A., Cairo, N. Y.

The editor will not presume to say which one of the many hundred block machines patented is the best for the conditions of our correspondent. MUNICIPAL ENGINEERING has tried to lay down the principles which should govern the selection of a machine and the manufacture of blocks on it, but must leave the selection of the machine for the individual blockmaker to him. The latest articles on the subject are "Establishing a Concrete Block Business," vol. xxxii, p. 88; "Conditions in the Cement Block Field," vol. xxxii, p. 54, and an article in the Machinery and Trade Department of this number. Another article will be found in vol. xxxi, p. 24, and another with further references to previous articles in vol. xxx, p. 281. Special attention is called to the series of articles by Louis H. Gibson, which began in the number for December, 1905, and to several articles by S. B. Newberry in the last four volumes. See also the letter on "Manufacture of Concrete Blocks" elsewhere in this department.

CONCRETE TANKS FOR DISTILLERY MASH.

According to your inquiry on page 90 of the February issue signed "C. C. C. Co., Louisville, Ky.," I have to say that concrete tanks or vats can be built with good success by the Monier system (see "Monier Construction," by E. Lee Heidenreich, price 50 cents). It is further advisable to have this work done by somebody who thoroughly understands this system, etc.

I further have to state that there is a tainting of the mash by the cement possible if the tanks are used immediately after their completion; therefore the tanks or vats should be filled with rainwater. Now this water will get quite hard. This method must be repeated twice or three times until water keeps its original softness. After this point has been reached,

the concrete will not affect the mash or liquids any more.

CHAS. BECKER,
Milwaukee, Wis.

HOW TO MAKE CONCRETE WALLS FOR COTTAGE.

I bought 60 acres of land last summer fronting on Mob Jack Bay, Virginia. I will build a home on it with moderate means. I bought your "Handbook for Cement Users." You know labor is expensive down there. For that reason I think it is practicable for myself to get posted on these things. According to the plans that I have drawn I need 1,218 cubic feet of wall, not including foundation. Stone is scarce and expensive, so it would be best to use gravel. As the walls will not be exposed to any extent, being protected by piazza, the formula (Concrete Class C 1:3:10, gravel) on page 340, used on the Connecticut Avenue bridge, Washington, D. C., and determined by A. W. Dow and W. J. Douglas, is what I ought to use, my way of thinking. Do you?

It is generally understood that sand from the seashore can not be used for concrete work, but a member of a prominent firm of contractors here in this city tells me it can be used. He says: "I put salt in and mix mortar in the winter time." Will you tell me whether he is right or wrong? Since I am only looking for durability and not looks, rough boards for molding would do. J. N.,
Bridgeport, Conn.

For the walls of the house the gravel concrete may very properly be used. Probably, however, the proportions should be greater than 1:3:10. This Class C concrete was used for the interior filling of piers, spandrels, etc., and may not be dense enough to shed a driving rain. The best mixture can be obtained roughly by following the method described in the article on "A Normal Concrete" in this number of MUNICIPAL ENGINEERING. This will be nearer watertight if the concrete is well rammed in place.

The objection to sea sand is not the common salt in it, but other salts which leach out and produce an efflorescence on the walls, which is not handsome, and is somewhat troublesome until it is all gone. Sea sand may also not be good because the grains are too round and all too near the same size, so that the mortar does not have the cohesion which it should. This is not true of all sea sand, and the sand at hand should be examined by an expert who can tell its qualities.

For forms use boards planed on one side, as described on page 197 of the "Handbook for Cement Users," and use a brick to rub down the green surface after the forms have been removed, as described on page 199, or a steel brush, as described on page 200, and a fine finish can be obtained at low cost.

ARE HOLLOW WALLS FOR VENTILATION OR DEAD AIR SPACE?

I wish to congratulate you on that straight, plain bit of advice you gave to "J." on page 88 of the February number. I wish every cement user in the country would read it. Please answer me this question: You will frequently see the hollow block wall exalted "because it can be made to give a dead air space." Then the next champion will cry: "Because it gives ventilation from any part of the building." Now which of the two is right, viewed from the standpoint of health, which, of course, includes moistureproof, frostproof and warmth?

W. F. RONEY, Grand Island, Neb.

Mr. Roney's question is referred to our readers for their consideration and reply. To retain warmth in a house or to keep it out of a cold storage house the air spaces must be enclosed and the air dead. To reduce the danger of moisture working through a hollow concrete block wall the wall should be thoroughly ventilated. and the warmer the moving air the dryer the wall will be. A dry wall will be frostproof. For health the ventilated wall promises best, but the expense of heating will probably be increased. If blocks or wall are not properly designed, or the blocks are too porous, the inside of the wall may have streaks or bands of dry and less dry surface. What has been the experience of those who have observed hollow block walls or hollow walls of any material, particularly those which have hollows alternating with through wings or partitions?

WHERE IS THERE AN OPENING IN THE LIME BUSINESS?

I was in the lime business for several years and want to get into it again. What method, if any, would you recommend one to pursue in order to get into touch with a locality where the conditions were favorable for an opening in this line?

R. E. D., N. Yakima, Wash.

The first method that occurs to the writer is to put this inquiry in the Question Department with request that our readers supply any information that can help our correspondent.

WHO SHOULD PAY FOR WATER METER?

We would like to ask if you can give us any information on the following points:

The city in which your plant is located has a municipal water plant. The city charges for the water by the gallon. There is an ordinance which requires the consumer to pay for and put in, at his own expense, a meter for measuring the water consumed.

The point upon which we desire information is this: Is it legal for any company or corporation to require the other party to pay for the necessary equipment for measuring what they undertake to deliver at so much per?

We have been advised by a mutual friend that you would probably be in a position to advise us intelligently upon this point, stating whether the case has been passed upon in this State by the courts. B. N. M., ———, Ill.

The question of ownership of the water

meter is one which has received much discussion and it has never been definitely decided. On the one hand, it seems equitable that the person who sells a commodity should be required to measure it, and where the plant is owned by a private company this is likely to be the method adopted.

On the other hand, there must be as many meters as there are taps and in case all taps are metered it is quite probable that the consumer pays less if he owns the meter than if he pays the charge for meter rent, repair and replacement which the company must add to its charges for water. Under municipal ownership the theory should be that the cost of operating, maintaining and renewing the works and of interest on the original construction must be met by the consumers, of which the city is one, and that there should be no excess beyond a reasonable fund for contingencies. On this theory it makes no difference whether the city or the consumer owns the meter, as the consumers must ultimately pay the expense, and there are no divisions of profits among stockholders.

Theoretically, therefore, it seems probable that the courts might require a private company to furnish meters while it might permit a city having a general meter system to operate under an ordinance requiring the consumers to pay for their meters.

The principles upon which this charge and others included in the meter rate for water are based are discussed in MUNICIPAL ENGINEERING, vol. xxx, p. 195.

In St. Paul, Minn., Buffalo, N. Y., Cleveland, O., Richmond, Va., Madison, Wis., Bay City, Mich., nearly all the meters are owned by the city.

On June 8, 1904, there was a refusal by Judge Brentano to grant an injunction against Berwyn, Ill., which village had passed an ordinance requiring consumers to use certain designated meters on penalty of shutting off the water supply, which seems to support a requirement that consumers pay for meters.

Atlanta, Ga., and Bloomington, Ill., require consumers to pay for meters.

The question of who shall pay for water meters is discussed in vol. xxiv, p. 367, and a number of opinions on both sides are given, none of the court decisions quoted being opposed to the payment by the consumer of the cost of the meter, and several of them upholding the charge of meter rent, which is really payment for the meter in instalments. None of these decisions happen to be from Illinois.

MAKERS OF GRAVEL PUMPS.

I would like to hear from firms manufacturing gravel pumps, as to capacity, cost, etc. If you can put me in touch with them, I would be very much obliged.
J. M., Galveston, Ind.

The following named companies manufacture hydraulic pumping machinery which is suitable for pumping sand and gravel: Irwin Van Wie, 715 W. Fayette St., Syracuse, N. Y.; M. Beatty & Sons, Welland, Ont., Can.; Wm. H. Cook & Co., Monadnock Blk., Chicago, Ill.; Lake City Engineering Works, Erie, Pa.; Lawrence Machine Works, Baldwinsville, N. Y.; Urie Boiler & Machine Co., Kansas City, Mo.

PUMPING BY AIR LIFT.

I understand in your issues of 1906 there are copies containing information regarding an "air lift pump." I should be pleased if you would be kind enough to mail me one or more copies containing all information as to air lifting pumping equipment, its methods, and so on.
P. H. E., St. Johns, Ore.

I would like to know of a good book on pumping by air lift and in what volumes of your magazine you treat the subject. M. D. S., Bemidji, Minn.

Hiscox's "Compressed Air" ($5) has a chapter on the air lift and one on pumping of water, acids and oils. Eight pages of Goodell's "Water Works for Small Cities and Towns" ($2) are devoted to the air lift for water. There are two pages in Folwell's "Water Supply Engineering" ($4).

The back numbers of MUNICIPAL ENGINEERING have several excellent articles on the subject. Among them are a general article on "The Air Life for Deep Wells," vol. xv, p. 240; "The Raising of Water by Compressed Air," vol. xxvi, p. 345; a list of makers of air lift pumps, vol. xxix, p. 17; a description of the municipal air-lift pumping plant at Des Plaines, Ill., vol. xxx, p. 338; "How Horizontal Runs Affect the Air Life," vol. xxxi, p. 297.

HOW TO BUILD A COFFER DAM.

Could you please inform me where I can obtain the best information regarding the construction of a coffer dam in a river with quick land bottom?
L. M., Sparta, Ont.

Fowler's "The Coffer Dam Process for Piers" ($2.50) is probably the best source of information.

ELECTRIC LIGHTING RATES.

Where can I find the data, or any form of data, which will show the rates charged private consumers for electric light in the leading cities of this country? Has MUNICIPAL ENGINEERING published such a list?
C. D. WILLARD, Sec'y Municipal League, Los Angeles, Cal.

The annual reports of the Gas and Electric Light Commissioners of Massachusetts, Boston, give in detail the rates

charged by all plants, both municipal and private ownership. They can probably be obtained on application to the secretary of the commission. Fluctuations in these rates are shown in MUNICIPAL ENGINEERING, vol. xxiv, p. 180, and vol. xxv, p. 236.

Several years ago the United States Bureau of Labor, now under the Department of Commerce and Labor, published a book of statistics of gas and electric lighting plants, which gives the rates charged by all plants reported upon. These reports are anonymous, but as they are grouped according to size, the plants of a kind are together and comparisons can be made readily. Possibly the report is out of print. Some averages taken from it will be found in MUNICIPAL ENGINEERING, vol. xix, p. 255. A comparison of the data from the above sources is made in vol. xxiv, p. 6.

Bulletin No. 6 of the League of American Municipalities, John MacVicar, secretary, Des Moines, Iowa, gives statistics including rates for many electric light plants.

A long list of articles in MUNICIPAL ENGINEERING on electric lighting, many of which give information about rates, will be found in vol. xxix, p. 96.

DESIRABILITY OF FILLER FOR BRICK PAVEMENTS.

We are beginning to pave the streets of this city and are having considerable discussion about the form of filler to use in brick pavements.

In about 17,000 square yards of pavement laid last season, the Pioneer asphalt filler was used with excellent results on all streets except one. On this street paving brick of local manufacture were used. The bricks were so smooth and uniform in size that, for the most part, there were no joints to fill and hence the asphalt filler was unsatisfactory. Now our brickmakers claim that this straightness and uniformity in their brick is a point in their favor, believing that the bricks that lie closest together and come nearest forming a perfectly solid brick surface are the best pavers.

Now it seems to me that, inasmuch as it is practically impossible to lay a perfectly solid and impervious brick pavement on account of these interstices between the bricks, and as this condition calls for some form of filler to bind the surface together and to render the pavement waterproof, then (1) there must be space enough between the bricks to allow the filler, of whatever form, to get down in the joint so as to be permanent; (2) if the bricks are made so smooth and straight that no joints are left for receiving filler, then the die should be so designed as to form a button about ⅛ inch thick near each end of one side of the brick. I admit that if the bricks could be laid so close as to form a solid, impervious surface, then the use of any form of filler would be useless. But as this is impossible, and as we must fill the joints, then we must have joints large enough to receive material in sufficient quantities to form a bond with the brick.

Is my argument good or not?

Can you give me names of brick manufacturers who make brick with buttons or other form of separators?

I have suggested to our people that they either put on the buttons or raise the name on the brick instead of having it indented.

I read the MUNICIPAL ENGINEERING magazine with a great deal of pleasure and profit. E. B. C., City Engineer,
———, Mo.

The makers of repressed paving brick usually put on the buttons referred to, raise the letters of the name, or use grooves so located as to cause the filler to flow down into and through the space between the blocks. All the pictures of paving brick in the advertising pages show either raised letters or grooves, and the advertisers not showing pictures make similar forms. Wire-cut brick are often too smooth to permit fillers to actually fill the joints, especially those which must be applied hot. Some specifications go so far as to require a filling strip of wood, removable after the row of brick is laid, to insure joint enough to fill easily. Others are satisfied with laying the bricks rather loosely. Perhaps the most common specification requires the brick to be laid closely, no matter how smooth they may be, some requiring that the rows shall be sledged up close at frequent intervals, using a plank to distribute the blows of the sledge.

The claim, formerly made, that sharp-edged, smooth-faced brick, laid close together, kept their smoothness most certainly was not borne out by the facts, the corners on the most closely laid bricks soon rounding off unless thoroughly protected by a hard and tough filling, and rounded or beveled corners are now in general use in repressed brick, approximating at the beginning to the ultimate form which the bricks will take. One reason often given for the more satisfactory wear of the repressed brick is the statement that they are more uniform in size and shape than the wire-cut brick and so will make a more even pavement.

The writer's own preference is for laying the bricks as close, both on sides and ends, as they can be, keeping the courses of brick straight. There is usually enough variation in size of smooth brick to leave room for the filler to run in, if the requirement of straight courses is met. The bricks are better wearing surface than any filler, and the amount of surface devoted to filler should be as small as possible. Bricks must be handled in the process of inspection after laying and if they can be handled with tongs they are, as the writer's observation and experience shows, far enough apart to permit the filler to enter the joints. Bituminous fillers ought to be used in hot weather, that the chilling may be as slight as possible.

It is not possible to do good work with a bituminous filler in freezing weather when the joints are as small as they ought to be.

BOOKS ON PAVING AND STORM SEWERS.

Will you please tell me where I can get the best information as to the need of providing an expansion joint at the curb in paving a wide street (60 feet between curbs) of 1 inch to be filled with pitch nearly to th etop and sand on top, or if simply filling the joints with pitch for a space of about 2 feet wide along the curb is all that is necessary. I find some specify nothing but the latter, while others recommend the former.

If you can tell me or refer me to any book or article published that will give me information on the subject, I will be much obliged to you.

Also where can I find the best practical information in regard to storm water sewers and catch basins, manhloes, etc., for taking care of the storm water on paved streets?

J. J. M.,
Grand Rapids, Mich.

Baker's "Roads and Pavements" ($5) is good authority on the brick paving question. Folwell's "Sewerage" ($3) has a good statement of the basic principles of the current methods of taking storm water off of streets. See also Baker's book for some details of the surface work.

WIDE TIRES AND COST OF MACADAM.

You say in the February number, page 97: "It is evidently much cheaper to build a macadam road" in a certain way, etc. Now why will you not say the most important thing right here? You should never fail to state in reply to such questions: "It would be very much cheaper to build a (any) good macadam road or street for wide-tire use, also very much cheaper to maintain it and likewise to use it, with narrow tires outlawed and abated."

On page 121 you say: "Assistant Postmaster General DeGraw says he finds the road question very difficult of solution, . . . and as the maintenance (failure) of efficient service on the rural free delivery routes with a close adherence to schedule depends upon the condition in which the roads are kept."

Mr. Editor, I do believe that you have never really grasped the force of my contention that the chronic bad condition in which the roads are kept, weather permitting, as a matter of choice and expense only, is the scandal of the age. Why will you let the poor Postoffice Department rest under so scandalous an error?

"The War with Dust" palés into insignificance by the side of the war we have been waging for centuries on our roads and streets.

The best remedy for the dust nuisance is to stop the war on roads and streets. Stop the cost of making dust, also mud. Why such a furor about the raising of dust? "A Contractor" says: "We have within our reach a remedy which will change automobiling to a pleasure. . . ." Yet he has no thought of wide anti-mud, anti-dust, anti-destruction, anti-friction, good wheel-tires.

Why not get some good contractor to tell us what he would have to charge to duplicate the mud mixing and stone grinding done by narrow tires, and salvable by use of wide tires?

We should not make any mud, and very little dust. This little dust would upon wet weather occasionally make a little mud, but properly wide tires would rapidly unmake that, whereas narrow tires always aggravate the trouble enormously before and after the rains.

Says D. Ward King: "The depth of the mud road problem I have appreciated for many years, but a realization of its other proportions came to me only within a year. When I heard Ohio confess that 50 per cent. of her public highways are still soil; when Massachusetts editors, almost in sight of the hub of the universe, asked to reproduce my speeches; when the most prominent good road advocate in Iowa, speaking from a rostrum I had just left, announced that Iowans would have reached the height of their ambition if they could secure a stone surface on 15 per cent. of their roadways; then did I begin to comprehend the immensity and endlessness of the struggle between civilization and an imperfect system of earth road management. Do we recognize it as a fact that many generations to come will be confronted with this problem? It has been handed down to us from the ages. And until this 'Missouri Idea' of road dragging was developed, the only answer was 'surface the road with stone or gravel.'

"That road dragging solves this problem is not denied by any one who has given it a careful test."

Certainly I deny that dragging a road surface back into shape can solve the "problem" created by dragging roads out of shape by using "narrut tires." Dr. Ward King's remedy, when applied, will keep the patient from dying too dead, but why not remove the cause which makes the disease chronic?

I really wish you'd get "A Contractor" to figure on the cost of making dust—the total dust, including that entailed on automobiles, of having dust to throw at the birds, although they make no dust.

J. M. HEISKELL, Memphis, Tenn.

SECRETARIES OF ENGINEERING SOCIETIES.

Will you kindly give me the names and addresses of secretaries of the leading engineering societies, for the purpose of obtaining literature relative to membership, etc.? A. C. P., Collinsville, Ill.

Following is from a list published monthly in *Ideal Power*:

American Institute of Electrical Engineers, Ralph W. Pope, 95 Liberty St., New York City; American Institute of Mining Engineers, R. W. Raymond, 99 John St., New York; American Society of Civil Engineers, Charles Warren Hunt, 220 W. 57th St., New York; American Society of Mechanical Engineers, F. R. Hutton, 12 W. 31st St., New York; American Society of Heating and Ventilating Engineers, W. M. Mackay, 235 Water St., New York; American Society of Naval Engineers, Theo. C. Fenton, Navy Dept., Washington, D. C.; American Society of Refrigerating Engineers, Wm. H. Ross, A-9 Produce Exchange Annex, New York; Association of Civil Engineers, Cornell University, C. L. Crandall, care Cornell Univ., Ithaca, N. Y.; Association of Engineering Societies, Fred Brooks, 31 Milk St., Boston, Mass.; Boston Society of Civil Engineers, S. Everett Tinkham, 60 City Hall, Boston; Brooklyn Engineers' Club, Joseph Strachan, 197 Montague St., Brooklyn; Canadian Society of Civil Engineers, Clement H. McLeod, 877 Dorchester St., Montreal; Civil Engineers' Club of Cleveland, Joe C. Beardsley, 1200 Schofield Bldg., Cleveland; Civil Engineers' Society of St. Paul, C. L. Annan, Dept. of Public Works, St. Paul; Connecticut Society of Civil Engineers, J. Frederick Jackson, New Haven, Conn.; Detroit Engineering Society, Clarence W. Hubbell, care Water Office, Detroit; Engineering Association of the South, Howard M. Jones, care N., C. & St. L. Ry., Nashville; Engineers' Club of Minneapolis, O. P. Bailey, 936 Lumber Exchange, Minneapolis; Engineers' Club of Philadelphia, Walter Loring Webb, 2922 Land Title Bldg., Philadelphia; Engineers' Club of St. Louis, R. H. Fernald, 3817 Olive St., St. Louis, Mo.; Engineers' Society of Western New York, Thos. J. Rogers, Municipal Bldg., Buffalo; Engineers' Society of Western Pennsylvania, F. V. McMullin, 803 Fulton Bldg., Pittsburg; Illinois Society of Engineers and Surveyors, E. E. R. Tratman, 1636 Monadnock Block, Chicago; Illuminating Engineering Society, A. H. Elliott, 4 Irving Place, New York; Indiana Engineering Society, Charles C. Brown, Indianapolis, Ind.; Indianapolis Engineers' Club, Chas. Brossman, Jr., Indianapolis, Ind.; Iowa Engineering Society, C. L. Bryden, Iowa City, Iowa; Louisiana Engineering Society, Marcel Garsaud, 1027 Eleonore St., New Orleans; Memphis Engineers' Society, J. H. Weatherford, Memphis, Tenn.; Michigan Engineering Society, F. Hodgman, Climax, Mich.; Montana Society of Engineers, Clinton H. Moore, Butte, Mont.; Ohio Engineering Society, E. G. Bradbury, 85 N. High St., Columbus, O.; Pacific Northwest Society of Engineers, Milnor Roberts, care University of Washington, Seattle, Wash.; Rochester Engineering Society, J. F. Skinner, 54 City Hall, Rochester, N. Y.; Scranton Engineers' Club, Alfred E. Lister, 921 Vine St., Scranton, Pa.; Technical Society of the Pacific Coast, Otto von Geldern, 1978 Broadway, San Francisco; Toledo Society of Engineers, John C. Oliphant, 2111 Ashland Ave., Toledo.

LISTS OF CONTRACTORS USING DRILLS AND COMPRESSORS.

Can you tell us where we can secure a complete list of contractors and engineers who are engaged in such work as to use rock drills and air compressors? We should like to get this list and will thank you kindly if you give us the information desired. C. P. T., Chicago, Ill.

Hendricks' "Commercial Register of the United States" ($10) contains classified lists of contractors under headings cut stone, stone producers, dredging, electric subway, granite building work, railroad, waterworks, etc., and the list of general contractors contains parenthetic classifications which will aid in selecting the class wanted. There are also lists of contracting engineers, mining engineers, etc.

MOSS IN RESERVOIRS.

Please give me information or where I can get information as to how to get rid of moss in a concrete reservoir.
I. L. H., Baker City, Ore.

Moss, as used by our correspondent, is probably a general term covering other plants, possibly algae. The best method of treatment depends somewhat upon the character of the vegetation, and it will be most satisfactory to secure the opinion of an engineer who is familiar with the growths in reservoirs and can examine the reservoir and the growths. There is great difference between stored surface water and stored ground water, and the question does not state which is used.

Articles on the subject in recent numbers of MUNICIPAL ENGINEERING are the following: "On the Prevention of the Growth of Algae in Water Supplies," vol. xxxi, p. 291; "Copper Sulphate Results," vol. xxxi, p. 467; "The Use of Copper Sulphate in Purifying Water at Anderson, Ind.," vol. xxix, p. 28; "Purification of Water by Copper Sulphate," vol. xxix, p. 245; "Some Experiments with Copper Sulphate," vol. xxviii, p. 467. The numbers containing these articles can be furnished at 25 cents each.

BOOK OF CONCRETE HOUSE DESIGNS.

Do you know of any one who gets out a portfolio of lithographed cuts of concrete houses, plans, etc.?

M. B. Chalybeate Springs, Ga.

Wittekind's plans for concrete block houses ($1) gives photographs of drawings of plans and washdrawings of completed concrete block house. Several of the cement manufacturing companies and several of the concrete block machine companies issue catalogues containing half-tone cuts from photographs. Reference to the "Business Directory" printed in each number of MUNICIPAL ENGINEERING under the headings "Cement," Concrete Blocks," "Concrete Construction Machinery," will give names of persons to whom to write.

SPECIFICATIONS FOR CONCRETE AND BRICK SEWERS.

Can you inform me of any source of information as to specifications for concrete and brick sewers?

J. C. C., Watertown, S. D.

Specifications for concrete and reinforced concrete sewers will be found in the "Handbook for Cement Users" ($3). See also Folwell's "Sewerage" ($3). Descriptions of work in several cities, giving abstracts from specifications, will be found in every volume of MUNICIPAL ENGINEERING. Request to the city engineers of neighboring cities will bring copies of their specifications, which will approach most nearly to local conditions, especially as regards materials.

CONCRETE FOR STREET PAVEMENTS.

Will you please give what information you have at hand as to the advisability of using concrete for street pavement? If you do or do not believe that concrete is as good as brick, please state your reasons therefor. If concrete is used, what should be the thickness, etc.?

C. F. S., Princeton, Ill.

Concrete has been used in a few cities for street paving and with fair success. Bellefontaine, O., has had the pavement in use nearly twenty years and where the traffic is reasonably heavy. The principal complaint made is that the pavement is slippery. The specifications require about 6 inches thickness, and are practically the same as for cement driveways as given in the "Handbook for Cement Users" ($3). The specifications in use in Richmond, Ind., Grand Rapids, Mich., Toronto, Ont., New Orleans, La., as well as those used in Bellefontaine, are given in back numbers of MUNICIPAL ENGINEERING. In all these cities, except New Orleans, the pavement is used only on narrow, rather flat streets or alleys. The New Orleans pavement was in a special location on an untraveled section between street railway tracks and is not really a street pavement.

A well-laid pavement seems to be desirable, and the only serious objection the writer has heard is to the slipperiness.

INFORMATION ABOUT ELECTRIC CONDUITS.

The Park and Cemetery Board of this city has introduced an ordinance requiring conduits to be placed in the paved streets of this city for all wires excepting trolley wires for the street railway. As I am a member of the Park Board and especially interested in this question, I would be pleased to have you advise me of some published pamphlet upon conduit systems or give me the address of parties engaged in this business. I have no doubt but what this matter has appeared in your municipal magazine some time during the past year or two, and would say I have taken your paper for about three years regularly, but same have been put away and are not now in a convenient place to get at; therefore if you have an index reference to the subject, this would also be acceptable.

C. H. P., Saginaw, Mich.

There are excellent chapters on underground electrical conduits and methods of laying them in Crocker's "Electric Lighting" ($3), Abbotts "Electrical Transmission of Energy" ($4.50), and Millers' "American Telephone Practice" (3). Specifications for construction are given in Abbott's "Conduits for Telephone Work" (50 cents). Following are titles of the more important articles in MUNICIPAL ENGINEERING on the subject: "Underground Electrical Conduits," vol. xviii, p. 32; a general article on electrical conduits, vol. xxvi, p. 311; descriptions of methods of construction of conduits of certain materials, vol. xxvi, p. 371; "High and Low Potential Wires in Same Conduits and Manholes," vol. xxii, p. 36; "Bituminized Fiber for Conduits," vol. xxvii, p. 130; "The Municipal Conduit System of Erie, Pa.," vol. xxviii, p. 1; "Conduits for Electric Wires in Hartford, Conn.," vol. xxx, p. 262.

CONSTRUCTION OF IRRIGATION DAM.

Please be so kind as to inform me where I can get a little information in regard to a reservoir for impounding water for irrigation. My intention is to make it 150 feet wide by 200 feet long and 25 feet deep. About 5 feet of the sides will be the banks of a gulley, the inside to have a slant of about 35 or 40 degrees and the outside 45 degrees. The material which I intend to use is boulders ranging from 3 feet in diameter down, of which I have an abundance on adjoining land. My idea is to make a layer of boulders, filling in between with smaller ones, earth and gravel, then another layer of boulders and earth, using water to settle the earth and gravel as the work progresses. I would face the bottom with boulders set in sand, as many gutters are

made, then filling the space between with fairly rich grout. The sides to be finished much the same with cement and small rock to fill up the space between the large boulders, care being taken before to get the sides as smooth as possible.

I desire to get your opinion as to the necessary thickness of walls at the top to safely hold this amount of water, or can you tell me in what publication I could find a formula or the desired information? J. F. S., Los Angeles, Cal.

The character of construction depends upon the possibility of the dam being overtopped with water and the amount of such overtopping. If the dam is not to be overtopped by water, Bassell's little book on "Earth Dams" ($1) gives the principles on which it should be constructed. Schuyler's "Reservoirs for Irrigation, Water Power and Domestic Water Supply" ($5), is the most complete book on the subject. See also the chapters on dams in Turneaure and Russell's "Public Water Supplies" ($5). The United States Reclamation Service is designing many dams which depart from ordinary practice more or less to fit the local conditions. A statement to this office at Washington, D. C., of the conditions and method of construction proposed may bring a copy of the specifications for a similar structure designed for some other locality.

Not enough information about the conditions is given to warrant an opinion by the writer on the sufficiency of the construction proposed. In fact, to render an intelligent opinion an engineer should have an opportunity to examine the site in some detail, that he may relate these conditions to those which have been met with in his practice.

MUNICIPAL PROBLEMS

Municipal Situation in Canada—A Weakness of Municipal Operation—Cost of Parks in New York—Vicksburg Has No City Engineer—Toledo Improvement Bonds—Large Order for Gravel—Improvements in Washington, D. C.

The Municipal Situation in Canada.*

BY HARRY BRAGG, MONTREAL, QUE.

Speaking in general terms, the three eastern provinces, Nova Scotia, New Brunswick and Prince Edward Island, follow the model of British municipal organization, even the titles of the officials being in many cases entirely different from those in use elsewhere; for instance, the Recorder, is the same as the City Solicitor in other Canadian cities, and has no judicial functions, but sits beside the Mayor in the Council, giving rulings on points of order, and opinions on the legal merits of the questions under discussion; while Common Clerk is the title of City Clerk in St. John, N. B., which also has a Chamberlain.

The municipal organization of the Province of Quebec is the result of a very gradual growth since the time of the French regime and has been evolved from the practice of England with some admixture of the old French manner of doing public work. The Municipal Code of the Proince of Quebec contains some provisions to meet local requirements that must appear strange; among these are clauses providing for the construction and maintenance of ice roads across the rivers between municipalities, with the proper number of beliges or small pine trees to mark the road; also the rules for the calling out of advertisements at the door of the Parish Church after morning mass on Sunday and the judicial sale of property at the same time and place.

The municipal laws of the Province of Ontario are based upon those of Great Britain, with certain modifications adopted from the more modern practice obtaining in the United States, although, very wisely, the plan of electing the technical officials of the city, as well as the judges, has been carefully avoided. This principle of making such positions as the clerk, solicitor, chief constable, etc., absolutely permanent is believed in all over Canada and has everything to recommend it. Then the powers of the Mayor do not correspond with those across the line, but are more in accord with the system in England.

The western provinces have followed the municipal organization of Ontario pretty closely so far as their newer and less complex needs have arisen. It may be noted that Manitoba has adopted the very simple system of land transfer in

*From a paper before the American Society of Municipal Improveemnts.

use in Australia, known as the Torrens system.

The paper then gave the history of the formation of the Union of Canadian Municipalities to aid in contesting the powers of public service corporations.

In civic government, Toronto has led the way in adopting a Board of Control in addition to the Mayor and Aldermen. The Controllers and Mayor are elected by the votes of all the electors, while the Aldermen are elected by separate wards. The Board, of which the Mayor is ex-officio chairman, prepares the business for the Council, in which they have seats and votes, thus taking the place of committees. They receive a fair salary and give a good deal of their time to the business of the city. As a result of Toronto's experience in this matter Winnipeg has decided to adopt the same plan and Montreal is discussing it also.

Municipal ownership does not obtain very largely in the eastern or older provinces, except in the case of waterworks, which are generally owned by the municipality. At the best a revenue more or less (and generally less) adequate is obtained from other privately owned utilities, as a trifling return for the value of the franchise which the citizens have given for nothing, and which they give value to. Montreal, for instance, gets absolutely nothing for the franchises for gas and electric light, the prices of which are exorbitant, and only a small amount from the street railway company. Toronto is better off as her income from the street railway is nearly $400,000 a year as her share of the revenue, and yet the company pays 8 per cent on its well watered stock of $8,000,000. In too many places, instead of owning the utilities the municipalities have given away for nothing a perpetual franchise. Two noteworthy exceptions are Guelph, Ont., which owns both steam and electric railways, as well as the lighting plant, and Westmount, Que., which has the first plant in America that develops municipal light from the incineration of its refuse and supplies its citizens at about half the rate they have been paying.

In the west municipal ownership is more common, and the newer towns are benefitting by the bitter experience of their older sisters. Port Arthur and Fort William, which, though in Ontario, are really in the west of Canada, are well known examples of enterprising and successful municipal ownership. They own their electric light plants, waterworks, street railway and telephone systems, and are not only giving good services at low rates, but are reducing the taxes by the profits from these enterprises. Neepawa, Man., has its own telephone system. Winnipeg is securing a supply of electric power to sell to manufacturers and the very suggestion of such a thing has made the private corporation cut the price of electricity in half. Medicine Hat, Alb., controls the supply of natural gas and retails it to factories at a very low figure besides lighting the city for a trifle.

The people are realizing that municipal government and ownership require clever and honorable men in the council; that public utilities are valuable; and that private ownership of public utilities, if permitted at all, must be under proper control and yield some appreciable revenue to the citizens who give the franchise and whose money supports them.

It is still more pleasant to note that the thoughtful citizens are awakening to the needs of the city beyond the absolute necessities; the need of more healthy surroundings for the homes of the toilers, of parks and open spaces as a necessity of public health, of playgrounds where the children of the poor can grow into vigorous men and women, of libraries and museums, of picture galleries and concert halls where mental growth may take the place of vulgar and indecent amusements, in short, of those things which make for the advancement of mankind.

A Weakness of Municipal Operation of Public Utilities.

The fatal weakness of municipal operation of public utilities is that it seldom takes into account absolutely necessary future expenditures. Private operation must do that, or lose credit and encounter bankruptcy. Public operation generally borrows on the general credit of the city and can let its plant fall into ruin without raising a protest from bondholders.

Moreover, city officials have not the keen interest of private owners in keeping up the value of properties. Such personal advantage as they reap from management of public utilities is in spending surplus revenue in reducing public charges to gain popularity. If they are honest they gain nothing by sinking money in keeping old plants in good condition or in charging off apparent profits for depreciation.

This is why municipal ownership is most successful in cases where cost of operation is small in comparison with that of a solid and permanent plant like that of city waterworks. But even waterworks wear out sooner or later and reveal the weakness and extravagance of political management of industrial enterprises. Many of the municipal water

systems of the United States are already old enough to begin to make the discovery.

We have been hearing a great deal of late years about the enormous waste of water by leakage in the older American cities. Part of this is due to carelessness of consumers and can be corrected by putting in meters. But perhaps even more is due in the cities to leakage from pumps and reservoirs and pipes that have been allowed to fall out of repair rather than to spend money on keeping them up. —*Minneapolis Tribune.*

Toledo's Twenty-Year Improvement Bonds Valid.

The Supreme Court of Ohio handed down a decision recently holding that the issue of $75,000 bonds by the city of Toledo to pay for the city's portion of street and sewer improvements, is valid. Birchard A. Hayes brought suit on the ground that the time of payment, twenty years, was too long, and alleging that the pavements would not be paid for before they were worn out. He also contended that it was illegal for residents of one part of the city to help pay for the paving of a street in another part of the city. The Supreme Court's decision was entirely in favor of the city on all points raised.

The Cost of Parks of New York.

In a report recently submitted to Controller Metz, of Greater New York, by the Bureau of Municipal Investigation and Statistics as to the cost of land for certain parks in Manhattan and The Bronx and the annual appropriations for parks in the five boroughs, it is shown that the original cost of the big parks has been as follows:

Park.	Area, Acres.	Cost of Lands.
Central	839.92	$5,028,844.00
Bronx	917.12	1,563,459.64
Pelham Bay ...	1,756	2,746,666.69
Van Cortlandt...	1,132.35	2,210,807.35
Crotona	155	1,281,261.43
Riverside Park & Parkway		2,837,639.85
Total		$24,111,539.81

Five additions have been made to Crotona Park since it was acquired, nineteen years ago, and six extensions have been made to Riverside Park since 1891. The Crotona Park extensions cost $140,000, while the extensions to Riverside Park cost the city $2,278,000. This was more than the original outlay for either Pelham Bay or Van Cortlandt, although the area of each of these parks in The Bronx is considerably in excess of one thousand acres.

All permanent betterments and original construction in connection with the city parks are paid for by the issue of corporate stock, and the parks are maintained by annual appropriations in the city budget. An idea of the amount of public moneys devoted to the maintenance of parks may be gleaned from the appropriations made annually since consolidation.

The cost of maintenance for the city parks, including the small parks in the various boroughs, has practically doubled in the nine years that have elapsed since the consolidation of the metropolitan district into the present city. These maintenance expenditures were as follows:

Manhattan Borough—1898, $758,470; 1902, $944,800; 1905, $1,207,105; 1906, $1,280,812.

The Bronx—1898, $230,200; 1902, $433,580; 1905, $551,302; 1906, $622,975.—*Park and Cemetery.*

Vicksburg Abolishes City Engineer's Title.

The office of city engineer has been recently abolished by the city council of Vicksburg, Miss. The city employs two paving engineers, making the office of city engineer an unnecessary expense, in the judgment of the council.

Large Order for Gravel for Concrete.

The largest order for concrete gravel ever placed for a concrete building in this country was recently awarded to the American Sand & Gravel Company of Chicago. The material is to be used in the new Montgomery Ward & Co. building at Chicago avenue and the river. The floor space will approximate 1,200,000 square feet, and the entire building, walls, beams, floors and columns, will be built of washed and crushed gravel, which material was selected in preference to crushed stone after very exhaustive tests made by the owners of the building. The amount to be used will be approximately 125,000 cubic yards or a train of 25 cars daily from April 1 to December 1.

Appropriations for Improvements in Washington, D. C.

The Senate Committee on Appropriations on February 12 reported the District of Columbia appropriation bill, carrying a total appropriation of $10,724,532.63, being an increase, recommended by the committee, of $687,298 over the amount of the bill as passed by the House of Representatives. The appropriation bill gives estimates in detail recommending amounts for county roads and streets, sewer construction, street sweeping by hand, playground sites, new parks, increase of water supply, etc.

ARTISTIC CONCRETE

Cement Surfaces—Artistic Treatment of Concrete—Concrete Surfaces—Finish for Concrete.

Treatment of Cement and Concrete Surfaces.

The artistic treatment of the external surfaces of concrete structures is a problem of great importance and is one in which many architects and owners of property are much interested. Thus far but little general progress has been made in this country, notwithstanding the successes made in Europe and in isolated instances in this country. Some contractors have gone so far as to deny the possibility of good work and one, whose education was attempted with reference to a bridge within the writer's knowledge, for which he had taken a sub-contract, has gone so far as to substitute Bedford stone for the concrete balustrade specified, because he could not produce satisfactory results by his own methods and would not try those which were presented to him as bringing satisfactory results.

Three excellent papers upon this subject were presented at the last convention of the National Association of Cement Users and they are given herewith as the latest expression from architects and engineers of the actual results and the possibilities in this direction.

The Artistic Treatment of Concrete.

BY A. O. ELZNER, ARCHITECT, CINCINNATI, O.

The consideration of concrete from an aesthetic point of view may strike the average cement user as inappropriate and impossible, for hitherto the term "concrete" at once suggested foundations, piers, dams, abutments, and nowadays it more than likely calls to mind columns, beams, floors, walls, and, in fact, the entire structural parts of buildings. But it must be evident that our experience with this new material, new only, however, in the sense of its adoption, will show that, like all legitimate and substantial structural materials, it too will prove to be susceptible to artistic treatment in design.

Wood and stone architecture are as old as the hills, and the art of the mediaevalist in developing true styles with these humble materials, rightfully belongs to the world wonders. Brick and terra cotta can scarcely claim quite as much distinction, although in point of artistic treatment, they were brought to high development in the Gothic art of Italy. Iron and steel, however, do not fare quite so well, except in a small way, along the lines of purely ornamental work, for when the modern rolling mill began to turn out its product of structural shapes, and engineers discovered the wonderful possibilities of riveted sections and connections, there was a great rush for structural iron and later for steel. Everything imaginable was made of it and more so in Europe than here. Bridges and viaducts, certain classes of business blocks and public buildings, even churches and cathedrals, all vie with one another in their architecture of iron and steel, and while some notable attempts achieved a measure of success, it required many years to develop an artistic style of design. And even at this late day structural engineers as a class seem determined to ignore the application of aesthetic principles to their designs of exposed work.

But we feel quite hopeful. There has been and is much teaching and preaching of aesthetics. Schools, periodicals and municipal art societies are doing much to educate popular taste and to create a demand for beauty in public works, and this campaign, whose influence is spreading rapidly, will undoubtedly bring designers to recognize and appreciate the necessity and propriety of combining beauty with utility in all visible constructions.

This problem will be greatly simplified in concrete work, for here for the first time we come to deal with a plastic material, which can be molded and modeled at will. Beauty, however, in structural design is worthy of the name only when, like beauty in nature, it has character. It must not be a servile copy of the style peculiar to some other material, but in fact must express the individuality of its own nature and must not dissemble.

It is just this peculiarity that we must be careful of in our concrete block architecture. At present the tendency in the manufacture of these blocks is to imitate split faces of stone ashlar. This is radically wrong in principle and should not be tolerated. A flat, smooth face will always look well. However, if a pitched or split face is desired, let it be produced by casting the block flat and then pitching off the face with chisel and hammer just

as is done with stone. The clean fracture of the concrete thus exposed will be eminently effective and artistic and will have all the merit that belongs to truthfulness. Plain concrete ashlar walls might in some cases be effectively relieved by the introduction of bands of decorated blocks with some simple ornament molded on the face, very much as is done with terra cotta. But by all means avoid molded rock-faced work. It is artistically bad. The frequent and constant repetition of a few regular sizes and patterns ruins an effect which should be counted largely as accidental, but always expressive of a fine artistic sense in the selection and grouping of the individual blocks. Artificially, imitation and misrepresentation are stamped all over such work and can be recognized at first glance.

Solid concrete walls have a great advantage over the block walls in that they lend themselves more readily to artistic treatment. This is especially true where they are used in suburban and country buildings, perhaps because of the touch of nature in the surroundings, which more nearly accords and harmonizes with the broad treatment that can be so effectively employed in wall surfaces.

Perhaps the best sources of inspiration that can be had for such treatment are to be found in the old Spanish Missions of California, which, although not of concrete, nevertheless at once suggest its use and, above all, are fine examples of the artistic value of broad wall surfaces relieved by exquisitely proportioned openings judiciously spaced and not infrequently embellished by a moderate use of ornamentation.

Let us say, then, speaking of domestic architecture, where walls are made of solid concrete, the surface should be as unbroken as possible, avoiding especially artificial jointing, of which such frequent use is made, and is obtained either by scratching a joint into the fresh mortar with which the surface is plastered after the removal of the forms, or by planting bevelled wood strips on the inner surface of the forms, thereby molding the joint directly into the concrete. Both methods are highly objectionable, utterly senseless and aesthetically very bad, and should be shunned. In work of moderate cost, where effects are to be sought in an inexpensive, straightforward and natural way, there can be no offense taken if the concrete is left untouched after removing the forms. In fact, this method has so much merit that it might with perfect propriety be classed as the most thoroughly artistic. That is probably just what the builders of the old Spanish Missions would have done if they had had concrete to use for their buildings. To be sure, if such treatment is to be used, some care should be exercised in the preparation of the form work, so that it will not result in the effect of a lot of patch work.

In more pretentious work several methods of treating the exposed concrete are available.

A thin skin or crust of neat cement usually is found to cover the surface where concrete was deposited wet and was well tamped. This crust may be removed while still soft by means of a stream of water having some force, or by stiff wire brushes, in which cases the forms must be removed promptly and just as soon as the work will stand it. This, however, involves considerable danger and should be done only by thoroughly experienced persons. If successfully accomplished, the effect of the rough surface thus produced is good and consistent, for it exhibits the material in its true nature and avoids all semblance of artificiality. This treatment, however, entails so many difficulties that it will not be very popular, and it will be advisable to adopt some other simpler and safer method giving similar results. The surfaces can be tooled all over with a chisel as in some classes of stone work, but while the result may be effective, it is rather expensive and slow work and will, therefore, be but sparingly used. It is difficult, too, to avoid loosening an occasional pebble or stone and thus spotting the surface with objectionable blemishes and possibly opening up some internal cavities which are quite apt to occur and so starting a leak in the wall.

A simple and inexpensive, yet thoroughly practical method of securing an artistic effect, consists of covering the wall surface with a splatter-dash coat of cement mortar applied by splashing it on with a paddle or a broom; or, better still, it may be first spread on with a trowel and then roughened by stippling with a stiff broom or brush or even a flat board, in which case the roughening is obtained by suction against the board. When such treatment as this is to be used it may be highly appropriate in some cases, and indeed quite interesting, to decorate parts of the surface with some simple panel-work free-hand modeling. In case of panels, it is best and simplest to adopt sunken work, as this can be readily produced by merely planting a board or block of desired shape against the inside face of form work, which leaves its impress upon being removed from the concrete. Or else reverse mold made of some artistic bit of carving for a panel, or over a door or window, or a frieze, etc., may be nailed against the forms, and the resulting impress will be thoroughly effective, although a much higher artistic value would be due

such work if it were modeled by hand directly in the cement mortar as it is supplied, and before it has had a chance to harden.

This sort of work is being done extensively and successfully in Germany, where the modern styles of "Nouveau Art" present abundant opportunity for endless designs. It is already finding much favor in our own country and ought to reach a high degree of development.

Moldings, especially in continuous courses, if attempted at all, should be of the simplest possible design: bold, yet of moderate projection and free from small, delicate members. Square offsets and beveled projections serve very well in the place of conventional moldings and rather accentuate the character of the work and heighten its effect. Dentils of fair size can be worked in to good advantage and with comparatively little difficulty. Such work should, however, be used sparingly on account of the impracticability of treating the surface of the resulting small members, unless great freedom and latitude are allowable without detriment to the artistic character of the design. It is particularly difficult to do this in case the walls are to be plastered over with cement mortar. Where this is done the work should be finished under the float rather than the trowel, so as to minimize the tendency to map-crack or craze, a great source of annoyance and disfigurement. Trowel finish, furthermore, almost invariably produces a series of blotches of different shades and textures which, if introduced into rough work, have much artistic value, but must be classed as nothing better than blemishes in smooth troweled surfaces. Moreover, it is extremely difficult and well nigh impossible in plastering over moldings or projecting band courses to keep the edges straight and true as they should be in smooth finish, with the result that the poor, slovenly workmanship imparts an air of cheapness and flimsiness to the building instead of the reverse—value and substance.

Such, then, are some of the readier methods that can be employed in producing artistic effects with concrete. This humble material, so replete with possibilities but as yet so little understood, is manifestly destined to take an important place in the construction of our buildings, and must, therefore, strongly influence their design. But it means long, continuous and close observance and study of its nature, its possibilities and its limitations, and if our designers will devote themselves sufficiently to this subject as it so well deserves, they will discover in concrete a new and useful friend, and with its help will evolve a new architecture that will be full of life and character, strength and dignity and all else that goes to make a living style.

The Treatment of Concrete Surfaces.

BY LINN WHITE, ENGINEER SOUTH PARK COMMISSIONERS, CHICAGO, ILL.

A pleasing and consistent surface finish generally has but little to do with the strength of a concrete structure, but it is not inconsistent with maximum strength in any structure.

Next to form or design, the character of the surface has most effect on the appearance of concrete, whether in a building, arch, wall or abutment; in fact, when the view is had at a very close range, or in such structures as retaining walls or pavements, the surface finish may take precedence over proportion.

It is not intended to attempt a full discussion of the subject, but only to describe some methods used in trying to obtain satisfactory surfaces in the various classes of concrete work done in the South Park System of Chicago.

The imperfections in the exposed surfaces of concrete are due mainly to a few well-known causes, which may be summed up as follows:

1. Imperfectly made forms.
2. Badly mixed concrete.
3. Carelessly placed concrete.
4. Efflorescence and discoloration of the surface after the farms are removed.

Forms with a perfectly smooth and even surface are difficult and expensive to secure. Made of wood, as they usually are, it is not practical to secure boards of exact thickness, joints can not be made perfectly close, the omission of a nail here and there allows warping, and the result is an unsightly blemish where least wanted.

Badly mixed concrete gives us irregularly colored, pitted and honeycombed surfaces, with here a patch of smooth mortar and there a patch of broken stone exposed without sufficient mortar. Careless handling and placing will produce the same defects.

But granting we have the best of labor, that all reasonable expense and care is had in making up forms, in mixing, handling and placing the concrete, that it is well spaded, grouted, or the forms plastered on the surface, the results are not satisfactory. All these efforts tend to produce a smoothly mortared surface, and the smoother the surface the more glaring become minor defects. The finer lines of closely made joints in the forms become prominent, the grain of the wood itself is reproduced in the mortar surface, hair cracks are liable to form, and, worst of all, efflorescence and discoloration are

pretty sure to appear. We surely have been working on a wrong theory.

It is of doubtful efficiency to line the forms with sheet metal or oilcloth. Imperfections still appear.

Two methods suggest themselves as likely to overcome the defects alluded to above: (1) treating the surface in some manner after the forms are removed to correct the defects, and (2) using for surface finish a mixture which will not take the imprint of and which will minimize rather than exaggerate every imperfection in the forms and which will not effloresce.

Methods of treating the surface by bush hammering, tooling and scrubbing with wire brushes have been described in various published articles, all of which have for their object the removal of the outer skin of mortar in which the various imperfections exist. But the method most used in the South Park work is the acid treatment. It consists of washing the surface with an acid preparation to remove the cement and expose the particles of sand and stone, and then with an alkaline solution to remove all free acids, and finally giving it a thorough cleansing with water. The operation is simple and always effective. It can be done at any time after the forms are removed, immediately or within a month or more. It requires no skilled labor—only judgment as to how far the acid or etching process should be carried. It has been applied with equal success to troweled surfaces, like pavements, to molded forms, such as steps, balusters, coping, flower vases, etc., and to concrete placed in forms in the usual way. It, of course, means that in the concrete facing only such material shall be used as will not be affected by acid, such as sand or crushed granite. It excludes limestone.

The treated surface can be made any desirable color by selection of colored aggregates or by the addition of mineral pigments. The colors obtained by selection of colored stone are perhaps the more agreeable and doubtless more durable.

There have been molded in the South Park shops blocks for buildings, columns, architectural moldings and ornaments with both red and black crushed granite surfaces, also pavements laid in patterns with red and black granite, all treated with the acid to bring out the natural colors of the stone. There has been a large quantity of concrete pavement laid with torpedo sand surface, colored a buff sandstone color with a small quantity of yellow ochre and mineral red and treated with the acid. The buff color imparted to the surface is a welcome relief from the glare of the ordinary whitish gray concrete pavement in the sunshine, and the etching of the surface adds to the softness of the color, at the same time preventing any slipperiness. This same buff color has been used to a large extent in steps, bases of lamp posts, and other molded articles to be placed on or near the ground. With white sand as the aggregate, thousands of pieces have been molded for coping balustrades, concrete seats, drinking fountains, pedestals, etc., which, when treated with the acid, appear like a fine-grained, almost white sandstone.

Where there are projections or marks left by the molds or forms they are tooled or rubbed down before treatment, and where it is necessary to plaster up rough places or cavities in the surface, it may be done, and after treatment can not be detected.

These various classes of work have been done on a large scale during the last three years in connection with the improvement of new parks and have in all cases proven satisfactory.

The second method of preventing or minimizing surface defects has also been tried in the South Park work with quite a measure of success.

During the years 1904, 1905 and 1906 groups of concrete buildings have been erected in nine different parks, costing, with their accessories, from $65,000 to $150,000 for each group. These buildings are all monolithic structures with occasional expansion joints, the exposed surfaces of walls being of a concrete composed of 1 part of cement, 3 parts of fine limestone screenings and 3 parts of crushed limestone, known as the ¼-inch size. This was thoroughly mixed quite dry, so no mortar would flush to the surface, and was well rammed in wooden forms made in the usual manner. The result was an evenly grained, finely honeycombed surface, of a pleasing soft gray color, which grows darker with time and blends admirably with the park landscape. In placing, it was not spaded next the form; it was too dry to cause any flushing of mortar, so there is no smooth mortar surface, the imprint of joints between the boards hardly noticed and the grain of the wood not seen at all. There is no efflorescence apparent on the surface anywhere and can not be on account of the dryness of the mix and the porosity of the surface. The buildings are used as gymnasiums, assembly halls, reading and refreshment rooms, and, as a rule, the same gray concrete finish is given the interior walls as the exterior. In some cases a little color has been applied on the interior walls and the walls of shower and bath rooms have been waterproofed with plaster. The porosity of the surface

makes it well adapted to receive and hold plaster.

This sort of surface is not as capable of treatment with acid as a smoothly mortared surface, nor is it desirable. Consequently the only color obtainable is the natural color of the cement-covered stone, but which is softer and far more agreeable than the gray of the pavement and, and is not impervious to water. Although it is evident the water enters the pores to a considerable extent, there is no evidence of injury from frost during the two winters some of these walls have stood.

The same finish has been used for retaining walls, arch bridges, fence posts, walls enclosing service yards, etc. In the buildings the thin walls were made entirely of this mixture, while in the heavier structures it has been used only as a facing. Two reinforced arches of 60-feet span were faced with this mixture, but the steel was imbedded in a wetter, more impervious concrete. This same dry mixture can be used for molded stones when the mold is open enough to permit tamping, and, of course, it is eminently suited to block machines.

A dry, rich mix, with finely crushed stone, has been found specially suited to another condition where a sound, smooth surface was particularly difficult to secure, viz.: for the underwater portion of a sea wall on Lake Michigan. It was mixed very dry and dumped in mass in sunken boxes joined end to end, made fairly watertight, but from which the water was not excluded. With the finely crushed stone a sound, smooth surface was obtained (when the sides of the boxes were removed) where it was manifestly impossible to plaster or grout the surface and where spading a mix of coarser stone simply washed the cement away from the surface stones. On account of the variable water level, it was particularly desired to have a sound, smooth surface.

Of the work described, most of the monolithic buildings, the arch bridges and some of the walls and paving have been done by contract. All of the molded work, the buildings made of blocks, service yard walls, etc., and all the acid treatment has been done by the park forces. Nearly all the various brands of Portland cement sold in the Chicago market have been used in varying quantities with equally good results.

In both methods described, honest work and careful inspection are as necessary for good results as in any other first-class construction. Neither method cheapens concrete work. The acid treatment slightly increases it. The surfacing with fine crushed stone adds nothing to the cost.

By the acid treatment, together with rubbing and chipping, all irregularities can be corrected. With the fine crushed stone surface all irregularities and form marks are not prevented, but they are greatly minimized.

In not all the work done by the second method were the results entirely satisfactory. The original specifications called for ½-inch stone, which was afterwards changed to ¼-inch. Experience taught the correct quantity of water to use for best results. But, altogether, both methods are so satisfactory that their use will doubtless be continued in the South Park work until something better is developed.

Finish for Concrete Surfaces.

BY HENRY H. QUIMBY, M. AM. SOC. C. E., ENGINEER OF BRIDGES, BUREAU OF SURVEY, PHILADELPHIA, PA.

The ordinary concrete structure—whether of building blocks or monolithic masonry, and whether as left by the forms or as commonly finished for exposure to view—is anything but pleasing in appearance, and this fact seems to be the principal reason for the disfavor with which some architects and engineers regard concrete as a material for construction.

The blocks usually have a bubbly, artificial-appearing surface subject to a discoloration that is generally of a sickly or lifeless hue, which offends the eye quite apart from the unpleasant effect of the machine-like regularity of such blocks as are made in imitation of rock-faced ashlar. Monolithic concrete is usually finished either by painting with a thin cement wash or by floating, and it is doubtful whether really satisfactory effects have ever been produced by either of these methods on work that was in the forms long enough to get quite hard. The material that ordinarily segregates against the mold forms a skin that seems to have the quality of making very uncertain the attachment to it of any coating, whether of neat cement, paint or of plaster; and if no coating be applied to it and the skin be not removed, the appearance of the work, particularly after a little aging, can be adequately characterized only in language that is too picturesque for a serious paper. There is, therefore, an active demand for a means of putting a better front upon a concrete body without overloading it in cost.

It has been suggested that a stucco finish can probably be made to adhere permanently, and it is reported that a plaster coating mixture of lime, cement and sand has been tried with gratifying results. A very handsome appearance can undoubtedly be thus obtained, but it is generally unlikely that the coating will endure wholly intact, and certain that it

will not unless the surface be first carefully prepared for it by some such method as treating with acid or by picking it rough, which altogether would make an expensive finish, and if portions should loosen and come off, the condition would be shabbier than anything else that can be conceived.

The mere roughening, however, of the concrete surface to insure the adhesion of a coating of any sort, will itself, if completely and uniformly done, produce a pleasing and ordinarily satisfactory finish —provided, of course, that the concrete has a complete face fully flushed against the forms.

It follows, then, that tooling the surface to the extent of removing the film is a practicable and always available method of finishing it, and the tooling can be done with a bush hammer or an axe, by hand or pneumatic power. The tool should be light, and the blows only heavy enough to "scalp" the work, heavy tools and blows being liable to "stun" the concrete, particularly at and near the edges. This scalping partially exposes the material of the aggregate, but does not clean it. The complete exposure and cleaning will come with time and exposure to the weather if the work be out doors; or the action of the elements can be anticipated by washing the tooled surface with a half-and-half dilution of hydrochloric acid, which, of course, must be thoroughly rinsed off.

The cost of such tooling, without subsequent cleaning with acid, has been variously found to be from 3 to 12 cents per square foot, according to the character and extent of the work and the equipment.

Experiments upon small blocks have shown that a very expeditious method of removing the skin is grinding with a coarse-grained emery or carborundum wheel. The skin is cut about as quickly as the block can be well passed over the wheel, and although no actual comparison has been made and there is no knowledge of a trial of it on large work with a portable wheel, it would seem that with a compressed air or electric motor and a flexible shaft, the emery wheel might be used on any work with about the same facility as a power bush hammer, and the rapidity with which the wheel cuts away the face indicates that such a method of tooling will prove to be no more expensive than bush hammering. The wheel might be small in size and therefore of light weight for convenience in handling, and could be fitted with small guide rollers to limit the depth of cutting and secure reasonable evenness in the dressed surface.

Building blocks have been treated, without the preliminary tooling, by immersion for a sufficient length of time in an acid bath strong enough to dissolve the skin and some of the cement mortar between the particles of the aggregate, exposing and cleaning the particles and even leaving them in relief. This process, which is said to have been patented, includes washing after the acid bath, then immersion in an alkali bath to neutralize any absorbed acid remaining, then final washing with water. It is presumably expensive, is of necessity limited in its application to portable work, and care must be taken to avoid using in the concrete any sand or stone that is liable to injury by the acid.

It thus appears that the removal of the film and exposure to view of the clean aggregate by whatever method obtained is the essential feature of the most certainly durable and generally satisfactory surface finish of concrete. Of course it should be understood that the surface must be fully flushed—must be without cavities or visible voids between the stones. This condition can only be secured, when pressure can not be applied, by using wet concrete thoroughly spaded or forked against practically watertight forms, or by using with stiffer concrete a separate mortar or fine concrete applied against the face form with a trowel just in advance of the body concrete. Stiff concrete will not completely flush against the forms by ramming, even if the ramming does work it to a liquid on the top of the layer. Care must be exercised with every portion of the face or voids will occur and appear when the forms are removed, and will necessitate patching. Such repairs can not be made sightly unless at the time they are made the body is still green—before hard set has taken place. If the surface is accessible while still friable, blemishes can easily be removed without leaving a scar.

This fact suggests the desirability of early removal of the forms, and their removal after the concrete has set sufficiently to maintain itself, but before hard set has taken place, furnishes the opportunity for applying a treatment that is very convenient and inexpensive, yet produces the most pleasing and in all respects most satisfactory finish which has yet become known.

The process consists wholly in scrubbing the fresh surface with a brush and water, thereby removing the film, and with it all impression of the forms, and exposing the clean stone and sand of the concrete. If it be done at the right time —that is, when the material is at the proper degree of set—merely a few rubs of an ordinary house scrubbing brush with a free flow of water to cut and to rinse clean, constitute all the work and

apparatus required. A little additional rubbing will bring the larger particles into appreciable relief, which heightens the effect and, in the judgment of most observers, enhances the beauty of the face.

The practicability of removing the forms at the proper time for such treatment depends upon the character of the structure and the conditions under which the work must be done. The system can not be applied to the soffit of an arch nor to the under side of a reinforced concrete floor, because the centering must be left as support so long that the surface against it is almost stone hard. If, however, the surface material there is the same as at the sides which have been scrubbed, the soffit can be brought to match the sides by tooling and then cleaning with acid and water as before described.

The texture and color of the surface obtained by this process will vary with the character of the aggregate of the concrete, because in a mixture of cement, sand and stone, the cement is in small proportionate volume and has but little influence on the color of the ensemble. Some opportunity is thus afforded for the exercise of individual taste in texture and color, and it is very easy to arrange a quiet color scheme in any work that may be suited to it. Warm tones can be obtained by the use of crushed brick or red gravel. A dark-colored stone with light sand will produce a surface that resembles gray granite. Fine gravel gives an appearance so like sandstone that even close examination will not enable one to distinguish between them. In the construction of monolithic concrete masonry for bridges for the city of Philadelphia it is the practice to use a fine concrete or granolithic face composed of (1) cement, (2) bank sand, and (3) crushed and cleaned black slaty shale, of the size commonly used for tar roofing—say ¼-in. to ⅜-in. The mixture is placed against the face forms and the body concrete is placed against it and rammed into it immediately. In the three years since this process was adopted and during which it has been applied to twelve bridges, no case of separation of granolithic face has been observed, and not a single hair crack has been found, nor any kind of deterioration or tendency to discoloration noticed—indeed, the weathering seems to make the surface cleaner and more stone-like.

In general the washing is done on the day following that on which the concrete was deposited. Portland cement is used. When a quicker setting cement than usual is met, or through some other influence the surface is found upon removing the forms to be too hard for the scrubbing brush, a wire brush is employed first, then a small block of wood or a brick bat with water and sand, which is found necessary to cut the film.

If the surface has hardened so as to require the grinding action of the sand and block, the aggregate will not be brought out into very decided relief and the face will, therefore, be comparatively smooth. In cold weather when crystallization proceeds slowly the forms may require to remain two days before the washing can be done safely, and in very cold weather they have been left a whole week and the scrubbing was successful.

Consideration of the cost of the process may involve the question of the design of the forms. When the work is such that not the whole height of it can be placed in one day, it may be advisable to construct the form so that the planks can be removed without disturbing the uprights. This will add to the cost, but may be compensated for by the saving in planks. In the case of a long or heavy wall, where only one course can be laid in a day, only one course of planks is required.

If indentations are made at the joints between courses, the joints can easily be concealed. If the indentations are not desired, great care must be taken to scrape thoroughly clean the top of each course quite to the face and to use the same consistency of the new granolithic facing as that of the lower course. It is possible thus to make a joint that will not be very noticeable, but the vigilance of the inspector must not be relaxed at any point, and even then the joint will be at least distinguishable. The bead indentations are very convenient and useful in working, and in appearance they relieve what otherwise would be a large blank area.

When the planks are desired to be removable, the studs are set at some distance from the face, 8 to 12 inches, and the planks are braced against them by cleats nailed so as to be easily loosened. The planks are in one width the full depth of a course, either solid or made up of narrow planks battened together. A triangular bead strip is nailed to the face at each edge and the layer of concrete is finished at the middle of the top bead.

When a plank is taken off it is scraped clean of adhering cement, then oiled and reset with its bottom fitted into the half indentation just left by the top bead.

A couple of carpenters with perhaps a helper will take off and reset a course of plank 100 feet long in four to eight hours. The course may be whatever is desired for either convenience or architectural effect. The yardage of concrete accommodated will vary, also, with the thickness of the wall and the proportions of

face to back. Thus the cost of changing forms will vary from 25 to 75 cents per cubic yard. In building work generally the ordinary forms can be used. Of course, care must be taken not to load members too heavily while they are green and naked, but the same care should be exercised with members still in forms, because the forms, while preventing collapse, will not prevent injury to the concrete by undue pressure upon it.

The cost of scrubbing is trifling if done at the right time. A laborer may wash 100 square feet in an hour, or the same area if it has been permitted to get hard may take two men a whole day to rub into shape.

The early removal of the forms allows the neat repair of any blemishes that may appear.

The question of efflorescence is an important one for consideration of the appearance of concrete structures. The scrubbed surface is not subject to the hair cracks that in some faces seem to absorb moisture during storms and then exude the white spreading disfigurement. But if there are joints in the work, there is danger of the efflorescence, and observation leads to the belief that if within 24 hours of the completion of a course the top surface be carefully scraped to remove every particle of the laitance, and then before depositing the next layer of concrete the scraped surface be coated with thin cement mortar, the joint ought to be impervious to moisture from either front or back, and no trouble with efflorescence ensue.

WATER AND LIGHT

Park Uses of Water—Philadelphia Filtration Contracts—Chicago Electric Light Competition—Chicago Gas Rates.

Investigation of Use of Water in Chicago Parks.

As a result of the recent trouble in Chicago over the water used by the South Park System, which Engineer W. A. Shaw says amounts to $100,000 annually, a subcommittee was appointed February 7 to investigate and report on the amount of water that is secured from the city free of cost by the various park systems. The sub-committee appointed by the council committee on water department consists of aldermen Cullerton, Bihl and Hurt.

Decisions on Philadelphia Filtration Contract Suits.

A decision was handed down at Philadelphia January 30 by Judge Abraham M. Beitler, who ordered the Daniel J. McNichol Company to refund to the city $117,427 which, it is alleged, has been unlawfully received by that firm. Involved are sixteen contracts and $11,000,000.

Judge Beitler's findings are briefly as follows:

Victory for the city on the five filtration contracts executed with the firm of D. J. McNichol while James P. McNichol was a member of select council.

No final decision on the six unfinished filtration contracts which were annulled by Mayor Weaver and which are the subjects of pending civil suits.

Decision for the McNichol firm in the five remaining contracts because the evidence does not prove conclusively that there was collusion between James P. McNichol, Israel W. Durham, John M. Mack, Daniel J. McNichol, Chief of the Filtration Bureau John W. Hill and former Directors of Public Works William C. Haddock and Peter E. Costello.

Under the decision annulling the five contracts made while James P. Nichol was a member of select council and while, in Judge Beitler's words, "the name of Mrs. James P. Nichol was used as a cloak for her husband," the contractors must pay back to the city all the profit made upon these five separate undertakings, amounting to $117,427.

Of the sixteen contracts five were executed prior to January, 1902, during the time that James P. McNichol represented the Tenth ward in select council. The city contended that James P. McNichol was one of the parties interested. Daniel J. McNichol was the bidder and the contracts were awarded to him and subsequently executed by him and on the part of the city by Mayor Ashbridge. A secret agreement was executed by Daniel J. McNichol in June, 1901, however, by which he agreed to give a share of the profits

on all filtration contracts then on hand or subsequently to be procured by him, to John M. Mack, Israel W. Durham and Mrs. James P. McNichol.

Judge Beitler finds that Anastasia Agnes McNichol was a mere figurehead representing her husband, James P. McNichol, select councilman, and that Mack and Durham and Daniel J. McNichol were aware of this fact and that, as to these five contracts, the fact that a select councilman was interested in each of them to the extent of three-twelfths rendered the contracts void and entitles the city to have the decree it seeks as to them.

These contracts are to be declared null and void and the defendants are to account to the city for all moneys received on them, being allowed, of course, what it cost them to finish the contracts since the city has accepted the work and is in possession of it.

Other contracts are attacked by the city on the ground that they were awarded to Daniel J. McNichol when he was not the lowest bidder. The report goes carefully into the law governing the award of municipal contracts and cites Supreme Court decisions, which are uniformly to the effect that the term "lowest responsible bidder" does not mean the lowest bidder, but rests in the director a discretion to choose one not the lowest bidder as the lowest responsible bidder, and unless fraud can be show in the award, the award must stand.

The city attacked all the contracts on the ground that Senator McNichol and Israel W. Durham were potential in the management of the Republican organization and that their power was "little short of governmental control." The city, however, asked to have all the contracts declared void on the grounds that Messrs. Durham and McNichol used their power to secure the contracts in fraud against the city's rights.

Regarding this Judge Beitler said:

There is, in fact, no sufficient evidence before me that Durham's political power ever amounted to "little short of absolute governmental control." He was a "boss."

He exercised control, and just to what degree the testimony does not disclose, in the management of the political organization of which he was one of the leaders. He had political power because the people either gave it to him or because he assumed it and the people did not take it away from him. The power was theirs as soon as they chose to come to their own to end his political domination and the political domination of the "machine" he had helped to build up.

But there is no principle of law of which I am aware nor any decision to which my attention has been called which prevents a political "boss" or the "leaders" of the organization from contracting with the municipality in which he exercises his power as "boss" or "leader."

It would make for civic righteousness if the "boss" could be kept from making contracts with the city in which he is "boss," but there are practical difficulties in the way of framing an act to accomplish the desirable end and there is no precedent for a court's so holding.

Perhaps the solution of the matter is for the people not to permit the existence of bosses.

To follow the city's contention in this case to its logical conclusion would make most of the city contracts of the past years void, for many, if not most of them, have been let to men who have had "political pull."

Judge Beitler decided that the law does not warrant him to annul the contracts on the ground of Durham's and McNichol's political power in the Republican organization.

He affirmed that Mrs. James P. (Anastasia Agnes) McNichol was not shown to have even known of her connection with the company until she was served with this bill. All negotiations in her name were carried on by her husband. The explanation of the use of her name by James P. McNichol was that, as he was a member of councils, his wife would join the firm in his place. She never paid into or received a cent from the firm.

Electric Light Competition for Chicago.

In the recent purchase of the Cosmopolitan Electric Company's franchise from the People's Gas Company, it is believed that E. H. Harriman is seeking to control the electrical and lighting power utilities of Chicago. The Cosmopolitan company has a franchise for the manufacture and sale of electric light and power. With this company Harriman expects to force the Chicago Edison Company, which furnishes light and power throughout the city, to consent to a consolidation with the Subway Company, which he now owns. The latter can be used to develop the light and power industry throughout the business district, and by cutting prices weaken the Edison company. It is said that as soon as the electrical companies are consolidated, the People's Gas Company will demand recognition for their turning over of the Cosmopolitan company to Harriman and form a combination of the lighting and power companies. About $25,000,000 is to be spent in developing the plants.

Fixing of Gas Rates in Chicago Enjoined.

The United States Supreme Court rendered a decision February 7, in the case of the city of Chicago versus Darius O. Mills. The case involved the ordinances of the city of Chicago fixing the price of gas at 75 cents per 1,000 cubic feet. Darius O. Mills, who resides in California but is a stockholder in the People's Gas

Company of Chicago, brought suit in the Illinois federal district court to prohibit the enforcement of the ordinance. The federal court rendered a decision in his favor. The city appealed to the United States Supreme Court.

The principal question at issue was a claim that the federal court lacked jurisdiction, and the city charged that the plaintiff's suit had been instituted in collusion with the company, the local citizenship of the company admittedly depriving the national courts of jurisdiction. The district court failed to find evidence of such collusion and on the merits of the case granted the injunction. The Supreme Court sustained the lower court by affirming its decision.

MUNICIPAL AND TECHNICAL LITERATURE

Knoxville Public Works—New York Water Commission—New Publications.

Public Works in Knoxville, Tenn.

The first annual report of Captain W. C. Crozier, city engineer of Knoxville, Tenn., has been submitted to the mayor and council. During the year 12,217 feet, or more than 2.3 miles, of concrete curb and gutter has been laid, for which the abutting property holder has been paid 28 cents per foot by the city; more than 11,000 square feet of concrete sidewalk was laid to replace the old worn-out brick walks, and 5,853 feet of old curb was taken up and reset; about 6,399 square yards of macadam was bought and placed on the street and about 500 cubic yards of excavation was done where it was actually required.

Mr. Crozier calls attention to the fact that portions of the city are badly in need of sewers.

New York State Water Supply Commission Report.

The second annual report of the State Water Supply Commission of New York has been submitted to the Legislature. The report embraces the following:

THE HUDSON RIVER.

The commission, with its consulting engineer, inspected the upper Hudson River to study the questions submitted to it by the petitions of the cities of Albany, Troy, Rensselaer and other places. It made an extended inspection of this country in view of the statement in the application that the flood waters of the Hudson are a menace to the health and safety of large numbers of people who reside along its banks. It was found that the utilization of many of the available sites for storage of flood waters would involve the flooding of State lands. This the commission believes is prohibited by the constitution of the State, and therefore the work of surveying and locating dams which would in any way involve the flooding of State lands will not be undertaken. There are, however, many places upon the Battenkill and Hoosick Rivers and other streams where storage reservoirs could be built, which would result in decreasing the danger of high waters below the mouth of those streams. It is also evident that the reservoirs thus constructed would greatly improve the available water power upon these streams and below their confluence with the Hudson.

On account of the question which has arisen in regard to the issuing of certificates to carry on the work relating to improvements asked for by the numerous petitioners, the commission has not insisted upon hearings in many cases, desiring first to ask that the law be amended. That portion of the law relating to the regulation of the flow of water courses and rivers for the purpose of protecting the public health and safety contemplates the defrayal of the expense of such improvements by the property benefitted. To that end, the law provides that the commission, as soon as the total costs and improvements can be determined, shall make a complete and verified statement thereof, and apportion the same in decimals between the several counties, towns, cities, villages and individuals, according to the benefits received therefrom, and shall determine whether the same

shall be paid in one year or in annual payments not exceeding twenty.

CONSTRUCTION OF STORAGE RESERVOIRS.

The intent and purpose of chapter 734 of the laws of 1904, as expressed therein, are to protect the public health and safety by regulating the flow of rivers and water courses, but it is obvious that under the statute it is especially sought to improve the water powers along streams whose waters it is desired to store and regulate at the expense of the property benefitted. The direct damage caused by floods in this State in a single year, according to the statistics reported by the State Water Storage Commission, has aggregated more than $3,000,000, besides the loss of life, physical and mental suffering, impairment of health due to resulting unsanitary conditions and the damage arising from interruption of public and private business, none of which could be assessed, computed or compensated. Consideration of the problem of so regulating the flow of rivers as to reduce this menace makes clear the fact that in the minds of many it can best be done by storing up the flood waters, thereby making it possible to prevent the annual or occasional overflow, which brings about the conditions dangerous to health and property. It is admitted that such overflows have been endured for years without appearing a matter of serious import to the State, but that fact does not indicate that it deserves no consideration.

The storage of flood waters can only be accomplished by building storage dams at favorable reservoir sites and at a large outlay of money. The reservoirs once built, however, if properly located, might so control the flood waters of the rivers of this State as not only to minimize the danger to public health and safety, but to make them a constant source of advantage to riparian owners and to the State. The law now provides that under certain conditions storage reservoirs may be built and the cost thereof assessed upon the city, town, village and individuals benefitted. The study made by this commission of the water storage question since assuming the powers and duties of the River Improvement Commission has led it to put a high estimate on the commercial value of the rivers and streams of this State. The commission is convinced that it is practicable to build storage reservoirs, as already indicated, on streams and at places that will not conflict with the provisions of the constitution for the protection of the State forest preserves, which will regulate the flow of such streams and thus carry out the law for protecting the public health and safety. This will enable the State to sell the waters so stored to persons desiring their use and make them a permanent and most important source of additional revenue. It seems to the commission that if the law were so amended that the State could control the flow of rivers and streams requiring such control, and could regulate the price at which such waters could be sold for power purposes, a valuable and permanent source of income would be secured. It has been estimated by the State Water Storage Commission that water power in this State could be made to produce an annual profit of $18,000,000, which equals, if it does not exceed, the net profits of agriculture in this State.

New Publications.

Types and Details of Bridge Construction. Part II. Plate Girders. Examples of constructed railroad and highway spans, describing and illustrating the essential features of calculation, design and manufacture of plate girders in the United States with analytical and practical discussions by bridge, consulting and manufacturing engineers. Recorded and classified for students, instructors, designers, engineers, architects, officials, builders and contractors. By Frank W. Skinner, M. Am. Soc. C. E. 410 pp., cloth. $4 net. McGraw Publishing Co., New York City.

The above description of the book from the title page contains the story of the book and its purpose. The preface amplifies upon this somewhat and indicates that the bridges described are not always approved as models, although not always criticised adversely when the author does not fully approve of them. The details given are considered typical or of interest but not always of the best design.

A careful examination of the book shows that the author has attained his purpose with unusual success. His classification of the subject is interesting and convenient and is quite detailed, as is shown by the following:

The six parts of the book are devoted to the general features of design construction and service, examples of railroad plate girder spans, details of bearings and splices, multiple railroad spans on steel towers and highway and special spans, with a series of discussions of plate girders by eminent designers.

The first part discusses in eight chapters American plate girder bridges, calculation formulae and assumed loadings, specifications, typical strain sheets and designs, drawings and records, construction and erection, and tests of complete girders.

The second part describes railroad plate girder spans, classified by length of span in four classes.

The third part goes into detail of bearings and splices, using the same examples as the second part and others. The titles of chapters are simple fixed end bearings, simple sliding end bearings, pocket expansion bearings, plain roller bearings, flange bearing pedestals, pin bearings in cast expansion shoes, pin bearings in riveted expansion shoes, pin bearings in cast fixed shoes, pin bearings in riveted fixed shoes, deflection bearings, miscellaneous bearings, web and flange splices.

The sections of the fourth part discuss viaducts, approaches and track elevations; and those of the fifth part are on long highway spans, plate girder aqueduct spans, cantilever spans and miscellaneous examples of plate girder construction.

In the last part Professor Jacoby discusses the computations required in the design of plate girders; Mr. Waddell, general designs and rules; Mr. Hodge, fundamental considerations in plate girder practice; Mr. Reynolds, essentials of plate girder spans; Mr. Deans, some features of plate girder construction, and Mr. French, plate girder construction for railroad bridges.

It is evident from this list that the book is a compendium of information on this subject which should have a place in the library of every engineer likely to use this class of bridge construction.

Quasi-Public Corporation Accounting and Management. By John F. J. Mulhall, P. A. 20 pp., half leather, $5. Corporation Publishing Co., Boston, Mass.

The State of Massachusetts has a Board of Gas and Electric Light Commissioners which exercises very close supervision over the lighting plants of the state and requires very detailed reports annually, covering all lines of the companies' activity. Forty pages of this book are used in printing the forms of report prescribed by the Board and the law giving the authority therefor.

The forms of bookkeeping recommended by the author are undoubtedly designed primarily to meet the needs of Massachusetts companies and municipalities in making the reports required, although the first set of forms given is for a waterworks plant, and the forms for other public service plants are made to conform thereto, except as to headings of columns. The reports required by the State Board are so complete that this results in an excellent series of forms for keeping the books of the corporations affected, Mr. Mulhall being a competent accountant.

The only comparison which the reviewer is able to make is with the American Waterworks Standard Bookkeeping System, designed by expert accountants for MUNICIPAL ENGINEERING COMPANY. This system was developed as the result of a competition for prizes for the best forms for waterworks bookkeeping and is a combination of the best parts of a number of excellent systems, none of which contained them all. In this comparison Mr. Mulhall's series of forms takes a second place, perhaps because it has been devised to fit given conditions without the modifying influences of other conditions which the American system enjoyed. The card system of keeping original records is much more fully developed in the latter system.

The first and second chapters of the book give instructions as to formation of companies and forms for stock certificates and various kinds of bonds.

The third chapter contains the forms for waterworks books above referred to and a number of auxiliary books for keeping records of construction, repair and operation.

The fourth chapter gives the forms for gas works, using the general system developed for waterworks and giving the headings of columns probably needed in a gas plant. The following chapters give similar treatment to the books of electric light works, steam heating works, telephone companies, and electric railways. In each case brief descriptions of each form are given as well as printed examples of the column headings in miniature as they would appear in the record books.

Forms for combined inspection and customers' registers are given in the ninth chapter. The card system of keeping the original parts of these records is so much more convenient that the omission of this system is somewhat surprising. The forms for the entries of the financial transactions are brief, but seem to require a consumer's ledger, which for regular accounts is quite unnecessary. Loose leaf registers are mentioned but not particularly recommended. The author does not recommend a form of card record of financial transactions with consumers which he describes, and very properly, for it is not properly designed, and is not properly applied to this class of records.

Forms for the purchasing, sales, engineering, chemical and testing departments are given, also some instructions regarding audits and examinations and a partial discussion of the subject of depreciation, particularly as required by the Massachusetts law. Definitions of funds and dividends are given in one chapter,

annuity, interest and sinking fund tables, and forms for reports of various officers and for miscellaneous instruments of various kinds.

A good bookkeeper should find this book of much value even though he does not use exactly the forms suggested, and the cause of uniformity in accounting and reporting forms will be aided by this presentation and application of the principles in the Massachusetts law and the regulations of the Massachusetts Board of Gas and Electric Light Commissioners.

Handbook of Cost Data for Contractors and Engineers. A reference book, giving methods of construction and actual costs of materials and labor on numerous engineering works. By Halbert P. Gillette, M. Am. Soc. C. E. 610 pp., leather pocket book. $4 net. Myron C. Clark, New York City

The author says in his preface that he collected data for this book for twelve years, and that it contains the material in two previous books, as well as much additional material. He has had some experience in contract work and in editorial work, which qualifies him for beginning in this book a collection and analysis of cost data which will ultimately be of very great value. This first approximation is itself of much value, though it has some defects and some deficiencies, due to the fact that it is the first venture in a line which has heretofore been neglected.

The first section of the book is upon methods of cost keeping, allowances for general expenses, contingencies, profits and other miscellaneous items, preparation of bids, etc., and contains many valuable hints for contractors and engineers, some of which are evidently based on costly experiences of the author and others upon keen observation of the work of others.

The chapters on cost data are collections of data about conditions of materials, labor, climate, moisture, etc., and of reports of actual cost of various kinds of work, some as a whole, but many thoroughly itemized. Naturally in so miscellaneous, though well classified, a collection there are many data from men who were not attempting to state all the conditions or items, and the reader will at times be disappointed by the meagerness of detail and the total omission of some lines. This should be expected, for no one is old enough or experienced enough to know about all the kinds of work touched upon and the author has been obliged to take many figures which are valuable so far as they go, but do not show the details which he recommends in his chapter on cost keeping. If the book leads more contractors and engineers to adopt methods of keeping cost in detail, it will have performed its most important mission. Perhaps it will induce some of the many contractors who now keep details of cost to be as liberal as the author in presenting the results of their labors to the public. Usually the contractor will allow little more than a glimpse at his stores of information regarding costs and methods of management of details, holding them as an important part of his stock in trade, which gives him an advantage over his less careful competitors, which he can not afford to give away. This is one great reason for the dearth of information concerning cost of work.

The classification of cost data in the book is under the heads of earth excavation, rock excavation, quarrying and crushing, roads, pavements, walks, stone masonry, concrete construction, water works, sewers, vitrified conduits, tile drains, piling, trestles, timber work, erection of buildings, steam and electric railways, bridge erection and painting, railway and topographic surveys, and miscellaneous structures.

The expert with many detailed figures of cost of his own collection is likely to find weak spots in many places, but the young engineer or contractor, and the more experienced contractor who is studying a new line of work will find many valuable pointers and with due allowance for the obvious lacks of detail and the differences in conditions can find much help.

The engineering and contracting world is much better off than it was without the book, and if individuals will accept the author's invitation to criticism and supply of new material, future editions will be still more valuable.

ROADS AND DRAINAGE

South Bend Sewer—Paving for Manila—Broad Tire Bill—Tar Macadam in England—Mt. Vernon Sewage—Calumet River Dilution.

A Concrete Sewer in South Bend, Ind.

Mr. A. W. Morris, assistant city engineer of South Bend, Ind., read the following description of the new concrete sewer on Fassnacht avenue, South Bend, Ind., at the recent convention of the Indiana Engineering Society.

The intention of this paper is to give a brief description and the method of construction of what is known locally as the Fassnacht avenue trunk sewer of South Bend, Ind.

The purpose of this sewer is to furnish sanitary and storm water drainage for the extreme western portion of the city and embraces an area of about 800 acres. This part of the city is built upon flat and marshy ground.

Of this sewer 5,887 feet has already been completed, 3,443 feet during the season of 1904 and 2,444 feet during the season 1906. Of this entire length, 1,670 feet is 72 inches in diameter and the remainder is 66 inches. That put in during 1904 was laid on a grade of 1 foot in 1,000 feet. That of 1906 was laid on a grade of 1 foot in 1,500 feet.

The type of sewer was that of reinforced concrete and consists essentially of 9-inch concrete ring of a mixture of 1-2-4 in the crown and 1-3-6 in the invert. The outside was made vertical from the center of the barrel to a point about 18 inches above the bottom of the concrete for convenience in construction as well as for additional strength. The reinforcing was done with 3-16-inch by 1-inch steel spaced 12 inches center to center along the length of the sewer. Each reinforcing rib was put in place in three pieces. The side pieces being approximately 2 feet long and straight, except for 3 inches of the lower end, which was bent at right angles. The side pieces are fastened to the hoop which passes over the arch by means of a ½-inch by 1-inch by 2-inch cotter. The connection is made about 5 inches above the center of the barrel. The steel is kept 2 inches from the inner surface over the arch. Immediately after the forms were removed the lower half of the barrel was plastered with a coat of 1 to 1 cement mortar ½ inch thick.

Manholes were made by setting the manhole form on top of the barrel form and building the same of concrete to the level of the top of the barrel concrete. From this point the manholes are brick of the usual double ring construction.

In going into the method of construction, only that part built during the season of 1906 will be considered.

The material encountered was loose black soil, such as is usually found in a marshy country, for a depth of about 4 feet; the rest was sand and gravel water-bearing for about 5 feet in the bottom. The water stratum made the use of a sub drain with rotary pump and sump necessary. The average depth of the trench was 18 feet with a width of 10½ feet.

The excavating machine used was of the type built by the Potter Mfg. Co.

The first two or three feet of the top material was either cast out or plowed and scraped. After that the use of the machine was begun. It was the custom to keep about 200 feet of trench open at one time, material being taken from the front and deposited in the rear of the concrete work. Nothing in the work of excavation was in any way new or unusual.

The management of the water by means of sub-drain, pump and sump was neat, effectual and economical and deserving of special notice.

The pipe used for sub-drain was second class and cull pipe laid with the invert 30 inches below the invert of the main sewer. Joints were loosely calked with tufts of sod in order to hold back the fine sand, and the whole covered with clean gravel of medium size.

The drain pipe emptied into a sump at the lower end of the new work, which was about 18 inches below the sub-drain grade, in which a 6-inch rotary pump was used to discharge the water over a dam in the old portion of the sewer.

Following this method it was possible to put the concrete in on a dry bottom.

It was found necessary, however, to run the pump while the invert was being plastered and keep going until the plastering was set, otherwise the water would force its way in from the outside and cause the mortar to slough down, leaving the bottom rough and the sides to some extent porous.

The construction of a reinforced concrete sewer as a monolith requires a method of procedure peculiar to itself.

The invert was put in place first and allowed to set, as many sections being put in place at one time as the expedition of the work with the force employed required. At this time the concrete was put in to a height of about 9 inches above the invert.

As soon as the concrete was set sufficiently the invert forms were removed and the forms for the sides were put in place, the lower portion of the reinforcing steel being set at the same time. These forms allowed the completion of the concrete work to the height of the center of the barrel. When this stage was reached and the concrete allowed to set, the outer forming only was removed and the forming for the arch and the rest of the reinforcing steel placed in position, the inner forming resting on that already set, and the outer forming being held in place by any means available each time, usually, however, by blocking it away from the inner form and suspending from sheeting timbers. The outer form was left open through an angle of about 70 degrees at the top, which was found to be about right for the speedy and efficient placing of the concrete. The inner forms were not removed for about 14 days after concrete was put in place. All concrete was put in place as wet as could be conveniently handled.

Through the kindness and assistance of the contractors, Hoban & Roach, we have been able to prepare a tabulated statement of the cost per foot of the work performed by them, which we believe to be fairly correct:

Concrete in sewer proper	$2.10
Reinforcement	.30
Striking and removing forms	.45
Setting forms and templates	.35
Plastering	.38
Sub-drain pipe	.33
Labor laying drain pipe	.35
Handling the water	.45
Excavation and backfilling	2.80
Setting and pulling of curbing	1.04
Tools and general expenses	.50
Total	$9.00

The item of handling the water included the fuel, housing and rental of the pumping engine, pay of the engineer, also the sinking of two sump holes for the pump and the filling of the same after the work was done.

Prices per day of ten hours for help on this work ranged about as follows:

Engineer for conveyor	$3.00
Fireman for conveyor	1.65
Common labor	1.85
Engineer for pumping engine	2.00
Sub foreman	2.50
Carpenter	2.50

At the time of letting the contract, bids were received on the type above described, the pipe furnished by the Reinforced Concrete Pipe Company of Jackson, Mich., the Parmley block and brick. The contract was awarded to the lowest bidder at $9.50 per foot.

The work was planned and carried out under the instructions of Mr. A. J. Hammond, city engineer of South Bend, Ind.

Paving For Manila.

The question of future paving in Manila, Philippine Islands, is being considered by the officials and citizens of that municipality. Figures and estimates prepared by L. F. Patstone, superintendent of street construction and bridges, show that there are now 386,000 square meters of city streets that ought to be repaved. Taking the general cost of the different kinds of street paving material available, the first cost would be about $4,000,000. The material which seems most desirable for such paving is molave blocks. Some of these blocks were laid about twenty-five years ago during the Spanish regime, and when taken up recently they were found in almost as good condition as when first laid. William Patstone is convinced that they are good for another ten or twenty years. By using these blocks it is argued a home industry would be patronized and many men given employment.

The Manila Times submitted a series of questions to Superintendent Patstone which, with the answers, are as follows:

1. What is the cost per square meter in building and repairing macadam streets? Answer—The annual cost of building and repairing macadam streets is 26 cents Conant per square meter per year.

2. What is the estimated cost of paving with blocks of hard wood per square meter; also with other kinds of paving experimented with here in Manila? Answer—The cost of paving the Escolta and Calle Rosario with Australian wood blocks on a concrete foundation and filling the joints with paving cement amounted to 9.89 pesos per square meter. The estimated cost of paving with other classes of pavement is as follows: Vitrified brick on a concrete foundation, 11.41 pesos per square meter; molave blocks on a concrete foundation, 16.48 pesos per square meter; asphalt on a concrete foundation, 5.98 pesos per square meter; stone blocks on a concrete foundation, 9.53 pesos per square meter; bitulithic on tar macadam, 3.99 pesos per square meter; creoresinate block on a concrete foundation, 11.50 pesos per square meter.

(A peso is worth 50 cents and a square meter equals 1.196 square yards.)

3. What is the estimated area of all

streets within the city limits not already paved, traversed by car lines? Answer—442,215 square meters.

4. What is the estimated area that the street car company would have to pave were the city to pave streets? Answer—119,172 square meters.

5. What is the remaining area to be paved by the city? Answer—323,043 square meters.

6. What is the estimated area of streets without car tracks, the traffic of which would warrant paving? Answer—63,000 square meters.

7. What is the estimated life of block paving in Manila? Answer—The estimated life of the various classes of paving for use in Manila is as follows: Molave or Ipil blocks, 30 years; Australian blocks, 6 years; vitrified brick, 12 years; asphalt, 8 years; bitulithic, 7 years; stone block, 30 years; creoresinate blocks, 12 years.

8. What paving has proved most durable and is best suited to the needs of Manila? Answer—In determining the class of pavement best suited to any locality, the character of the traffic and the climatic conditions are the determining factors. These two factors determine the annual cost and should be considered in conjunction with the ideal qualities of a pavement. The ideal pavement is one which offers a good foot hold for horses, is easy of traction, noiseless, dustless, free from mud, easy to clean and is sanitary. The annual cost of a pavement is the sinking fund paid each year to equal the original cost of the pavement at the end of its life plus the annual interest and cost of repairs. It will be seen from the above that the original cost and the life of the pavement are the principal factors in determining the annual cost. The estimated annual cost of the various pavements is as follows: Australian wood blocks, 2.05 pesos per square meter; Molave blocks, .95 pesos per square meter; stone blocks, .57 pesos per square meter; creoresinate blocks, 1.07 pesos per square meter; bitulithic, .85 pesos per square meter; asphalt, 1.07 pesos per square meter. If the selection of the paving best suited for Manila was based solely on the annual cost, the paving would rank in the order named: Stone block, bitulithic, Molave block, vitrified brick, asphalt and Australian wood block. Other questions than the annual cost, however, should be considered in making the selection, and although the stone block has a less annual cost than any of the other pavements, it is far from an ideal pavement, in that it lacks the qualities of being noiseless, easy of traction and of offering a good foothold for horses. The bitulithic pavement can be used to advantage on light traffic streets and for such should prove an ideal pavement. Care, however, will have to be used in laying the bitulithic pavement, to see that clean hard stone is used, and that the bitumen composing the mixture is of such a character as to be free from the tendency to rot. The Molave block will prove an ideal pavement under all conditions. Vitrified brick can be used to advantage on streets of average traffic. The only objection to the same would be that it is slightly noisy. The creoresinate block is being used extensively in the States at the present time and appears to be giving satisfaction. This creoresinate block consists of pine treated with a mixture of 22 pounds of creosote, oil and resin per cubic foot. Municipalities in the States are obtaining ten years guarantees from contractors for this class of pavement, and from its sanitary qualities it would undoubtedly prove an ideal paving for Manila. The city has some asphalt paving on the Ayala bridge which will enable it to determine two principal points in regard to this class of pavement for use in Manila, viz.: slipperiness and the proper character of bitumen to be used in the mixture. The majority of vehicles being two-wheeled places the weight on the horse's back and causes him to throw his feet further forward than he would ordinarily, and so the question of slipperiness of a pavement is a very important one for this section. The question of the class of bitumen to be used in forming the asphalt mixture is one which will have to be carefully studied in order to insure a pavement which will not rot during the rainy seasons, which this country is subjected to. Mr. Dow, the expert for the U. S. government at Washington, has found that Bermudez asphalt has best withstood this tendency. Wood block pavement, which is subject to the attack of the white ant, should not be laid under any circumstances. The Australian block comes under this heading.

9. What are the possible benefits to be derived from repaving? Answer—The installing of a permanent paving will do away with the mud nuisance, will reduce the dust nuisance, will provide a surface which is easy of traction and a pleasure to drive over, will reduce the annual cost of cleaning and do away with the necessity of frequently closing the streets for repairs. After the installation of the new sewer and water systems it will be possible to install a permanent

paving as above outlined. The funds necessary for this work can be obtained by a bond issue to run for a period of 25 years.

The city's portion of the paving that should be laid amounts to approximately 286,000 meters, the first cost of which would amount to 4,000,000 pesos.

The sinking fund necessary to cancel a 4,000,000 pesos bond issue at the end of 25 years amounts to 242,735 pesos per year. If, upon the completion of the new water and sewer system, the city's financial condition would permit of a paving bond issue as outlined, the results obtained will go far toward making Manila one of the leading cities of the Orient.

Opposition to Broad Tire Bill in Congress.

The Babcock bill, which has passed the House, and which provides for a 4-inch tire on the wheels of certain vehicles, has been strongly criticised by the Carriage and Wagon Builders' Association, which is composed of fifteen of the leading carriage and wagon builders of Washington, D. C. At a meeting held by the association, February 13, it was announced that the broad-tire bill now before Congress regulating the width of tires on wagons of 4,000 pounds weight was considered unfair and unnecessary.

Tar Macadam in England.

Mr. P. R. MacNamara, Canada's commercial agent at Manchester, furnishes an interesting report concerning the use of tar macadam in England. It will be found in No. 154 of the weekly report issued by the department of trade and commerce, Ottawa.

In Newcastle it is found that furnace slag from blast furnaces is the best material for holding the tar, but slag is not a necessity. Any road stone that is hard and absorbent is found to be well suited. It must be hard to give the proper surface and absorbent to take up and hold the tar oils. The slag or stone is graded from a 2-inch size at the bottom to a ½-inch size on the top, with a 1-inch layer between. Each layer is treated separately with tar and it rolls down without further binding. It may be mentioned that nowhere in the report is dirt suggested as a binder. The chief advantages of roads made in this way are their durability and their comparative freedom from dust. Streets laid with tar macadam in Newcastle have not been touched for five years, and now only want renewing with a surface coat. The heat has not affected them. How they would be affected by the severe frosts of a Canadian winter is, of course, another question.

The Northumberland engineer is at present engaged in laying 8 miles of tar macadam, which he claims to be both durable and dustless. The extra cost of mixing the tar and stone so far has been about 30 per cent. greater than for ordinary broken stone, an increase which, it is expected, will be more than compensated for by the increased value and durability of the road. By employing machinery to mix the material in the future, it is expected that tar macadam will cost no more than ordinary macadam.

The engineer of the Ethington district, a suburb of Manchester, says that tar macadam in one form or other, has been largely used in his district for the past twelve years. The chief point to be observed is the obtaining of good, sound material, with sufficient porosity to absorb, when heated, the oils of the tar. The custom there is to put down the material in two layers 3 inches deep each, rolled separately. The bottom layer is broken to a gauge of 2¼ inches and the top to a gauge of 1½ inches. The life of a road made in this way is from eight to ten years.

Generally speaking, it may be said that the cost of tar as compared with ordinary macadam runs from a little more to twice as much, but the durability of the road is increased four-fold, while the dust nuisance is greatly abated, if not entirely removed.

Investigation of Need of Chicago for Lake Water to Dilute Calumet Drainage.

An opinion from the Judge Advocate General of the Army has been received by Secretary Taft to the effect that he has legal authority to issue a permit for the diversion of water from Lake Michigan into the Calumet River at Chicago. Secretary Taft has, therefore, called upon the chief of engineers to pass upon the application of the sanitary board of Chicago, as required by law, when he will, in turn, consider the application.

Mt. Vernon, N. Y., Must Instal Sewage Purification Plant.

A decision was rendered by Justice Kelly of the New York Supreme Court, February 15, in the suit of property owners to prevent the city of Mount Vernon, N. Y., from continuing to discharge sewage into the East Chester Creek. Justice Kelly held that the city of Mount Vernon has no right under its charter to ruin the creek. The city will be compelled to instal a sewage disposal plant at once.

The city of Mount Vernon employed a

number of sanitary experts, who testified that the discharge into the creek did not cause a nuisance, but Justice Kelly was not impressed with the testimony offered by them to prove that the present discharge of raw sewage from a city of 30,000 population would be barely perceptible in a current which they admitted was already badly polluted, but in which there is room for a little more sewage.

It is believed that Justice Kelly's decision will have an important bearing on the fight which the Merchants' Association is making against the construction of the proposed big Bronx sewer, which would drain a large section of Westchester county into the Hudson River above Spuyten Duyvil.

ORGANIZATIONS AND INDIVIDUALS

New York County Engineers—Illinois Engineers—Connecticut Engineers—Ohio Engineers—Prizes by Cement Manufacturers' Association—Civil Service Examinations—Personal Notes.

New York County Engineers' Association.

At a meeting of the New York State Association of County Engineers, January 30 at Albany, N. Y., resolutions were adopted favoring the appointment by the Legislature of a commission to re-draft the highway laws of the State; favoring an amendment to the Higbie-Armstrong law providing for the consultation of county engineers in preparing plans and estimates of the main market roads; favoring supervision of the maintenance of these roads and providing that highway improvements in money-system towns shall be conducted by the county engineers. The association voted in favor of holding the supervisors' annual highway convention in Albany not later than February.

The association elected officers as follows: President, C. H. Smith, Orange county; vice-president, C. A. Fowler, Dutchess county; secretary-treasurer, F. E. Bogardus, Onondaga county; executive committee, E. Diebl, Erie county; C. H. Smith, Orange county; W. P. White, Oneida county.

Illinois Society of Engineers.

The twenty-second annual meeting of the Illinois Society of Engineers and Surveyors was held at Peoria, January 23, 24 and 25. In his annual address, Dabney H. Maury, chief engineer of the Peoria Water Company and president of the society, took for his subject the progress of pumping machinery, in which he reviewed the development of different types of pumping engines and also of deep-well pumps. The latter included reciprocating pumps, the air lift and the use of centrifugal impellers carried by a vertical shaft within the well.

Local engineers then submitted papers describing in general municipal engineering in Peoria. A paper on "Street Pavements and Sewers" was presented by C. M. Dolan, in which he stated that Peoria with 8.42 square miles of area has 55.45 miles of paved streets—40.59 miles of brick, 12.70 miles of asphalt, and the remainder of stone, block cobblestone and novaculite. The city also has 84.26 miles of sewers, of which 21.59 miles are of brick and the remainder of pipe. The combined system is in general use, although portions of the city have sanitary sewers only.

T. L. Burkland, assistant engineer of the Peoria Water Company, read a paper on "The Water Supply System." Lewellyn Owen, assistant engineer, described the gas, electric and steam heating plants of the Peoria Gas and Electric Company. The city has 125 miles of mains, with 160 miles service pipes for 9,500 consumers. The electric light plant has 4,800 consumers, using 807 street arc lamps, 1,123 commercial arc lamps, and 13,000 incandescent lamps of 16 c. p. and motors of 3,050 h. p. The steam heating system has 6,949 feet of 4 to 18-inch pipe, supplying 117 consumers with 146,000 square feet of radiation. In addition the company also heats their hot-water systems.

Other papers read were: "The Work of the Illinois Geological Survey," H. Foster Bain, of Urbana, director of the Survey; "The Illinois Water Survey," E. Bartow, of Urbana, director of survey. The discussion following these papers resulted in the appointment of a special engineering investigation committee to cooperate with the Illinois Geological Survey, the Illinois Water Survey, the Illinois State Highway Commission and the Engineering Experiment Station of the University of Illinois.

John W. Alvord, M. Am. Soc. C. E., of Chicago, submitted a paper on the "Water Supply and Sewerage of Gary, Ind., as follows:

"We plan to provide water by means of tunnel extending beneath the bed of Lake Michigan, taking water from a submerged intake 7,000 ft. from the shore and conveying it three miles to the center of the city. It is estimated that this tunnel will yield more than 60,000,000 gallons per day. From the shore shaft of this tunnel the water will be pumped with transmitted electric power generated by waste gases from the steel plant. The pumping units will probably be motor-driven centrifugal pumps, and the pumping station will be located in a public park in the center of the city. . .

"With 10,000 to 12,000 workers in the steel mills, 50,000 to 60,000 residents are expected, and two square miles of completed city area are being laid out and provided with sewers, water, gas, electric light, paving and sidewalks. The price of these improvements is added to the cost of the lots, which are sold subject to reasonable building restrictions. The city is incorporated under the laws of Indiana. The steel works will cover about two square miles adjoining the lakes, and will have a pumping plant of 100,000,000 gallons daily capacity. The writer is only charged with the design and construction of the water supply, sewerage, drainage and sewage purification of the city proper. About 21 miles of 6-in. to 30-in. water distribution pipe is now being laid. All pipes and sewers are laid in the alleys, so that the street improvements will not be impeded or injured. This location presents certain difficulties which are overcome in this instance by reserving right-of-way through and along the edges of certain lots for connections to hydrants and catch-basins, which are desirably placed in the center of the long blocks. This method probably would not be practicable with varied ownership.

"As the Calumet River has a minimum flow of hardly two or three cubic feet per second and as the only other outlet for drainage, Lake Michigan, is required for water supply, it is evident that sewage purification must be extensively introduced. The general elevation of the city is 18 to 20 ft. above Lake Michigan, and a combined system of sewerage was adopted for the following reasons: (1) A separate system, especially if placed lower than the storm-water sewers, would be filled with a large amount of percolating soil water, in spite of every attempt to make the sewer wells tight; (2) the porous nature of the sandy soil and the flat character of the country do not indicate a large run-off per unit of area; (3) a reasonable amount of dilution water in sewage rather facilitates its artificial purification, but does not require proportionate increase in capacity of the purification plant. These considerations decided the question in favor of a modified combined system with capacity equal to those drainage systems used in the outlying sandy districts of Chicago.

"The sewer system is to empty its flood water into the Grand Calumet River, and have its dry weather flow pumped to a purification plant. This decision is confirmed by two features peculiar to this locality: (1) Sandy soil for intermittent filtration is plentiful, and the adoption of sedimentation or septic action, followed by intermittent filtration, is indicated as the most economical and advantageous adaptation of the local resources of the district to the purposes of sewage disposal. (2) The operation of the steel plant will cause the waste of about 75 cu. ft. per second of fresh water from condensers and other machinery at a point near the mouth of the sewers, and it is believed that this will keep the river in good condition in spite of the occasional storm-water overflow from the sewers. The site for the filtration plant and its details have not yet been worked out, but it will evidently be of considerable capacity.

"In connection with the sewerage and drainage of Gary, interesting studies have been made as to ground water percolation in sand subsoils, both at Indiana Harbor and in the suburban sandy districts of Chicago. From these studies it is believed that the percolation into the sewers at Gary will not exceed 1,000,000 gallons per day per square mile, after the ground water has finally taken its new lower level."

In a paper on "Granite-Top Macadam Streets in Oak Park, Illinois," R. I. Carpenter described the new guarantee system in Chicago as follows:

"Specifications for pavements in Chicago have recently been revised and some radical changes have been made. The 10-year guarantee formerly required on all

except macadam has been reduced to five years, and in place of a surety bond the city retains 5 per cent. of the amount of the contract. If the work is found in good condition, one-fifth of this percentage is paid to the contractor on Dec. 1 of the year next following that in which the work is completed, and a like amount each succeeding year under the same conditions. It will be noted that a contract completed after Dec. 1 is practically guaranteed for six years. The wisdom of reducing the guarantee period from ten to five years, especially on asphalt pavements, is questionable. Bids received since the change show that it has reduced the price for asphalt from 5 per cent. to 10 per cent., but while this will reduce the burden placed upon the property owner it will greatly increase the rapidly growing repair bill which the city is called upon to meet. Experience shows that asphalt pavements are not adapted to streets subjected to very heavy traffic, especially if they have street-railway tracks, and streets paved with asphalt in the "down-town" section of Chicago need repairing about every month.

"The change from the bonding plan to the cash reserve plan was introduced by the fact that a number of contractors have refused to make repairs, or have gone or been forced out of the paving business, and have left it to the surety companies to maintain their work in good repair. These sureties usually find it cheaper to let the case go to the courts than to make repairs; the matter then drags along for years, and in the meantime the city is forced to make the repairs to keep the streets in passable condition. A clause in the contract under the cash reserve plan gives the city the right to use the money retained not only upon the particular contract which it may find necessary to repair, but to use any money that may have been similarly retained from the same contractor upon any other contract."

Other papers read were: "Roads and Streets," by A. N. Johnson, of Springfield; "Paving Brick and Brick Paving," W. P. Blair; "Waterways and Canals," R. R. Bourland, J. W. Woermann and J. A. Harman; "The Hennepin Canal," F. W. Holmes, of Sterling; "Drainage," by W. P. Bushnell, of Quincy, Ill., and L. C. Hicks, of Omaha, Nebr.

Officers were elected as follows: President, C. B. Burdick, Chicago; vice president, A. N. Johnson, Springfield, Ill.; trustees, J. A. Moore, of Chicago and R. L. Wallace, of Peoria; secretary, E. E. R. Tratman, Chicago. The next meeting will be held at the University of Illinois at Champaign in January, 1908.

Connecticut Society of Civil Engineers.

The Connecticut Society of Civil Engineers held a convention Feb. 12 and 13 at Hartford.

Mr. Lewis M. Haupt, consulting engineer, of Philadelphia, Pa., delivered an address on "Epochs of Transportation," including the relation of water to railways; the obstacles of our internal transportation; vested interests; growth of population and of tonnage, etc. It was illustrated by a series of stereopticon views.

Mr. John F. Trumbull, C. E., of New Haven, presented a paper on the "New Haven Cut" work, illustrated by lantern slides.

Other papers were "The Charter Oak Sewer System, Method of Assessment," by A. B. Alderson, town engineer, West Hartford; "Some Tests in Sighting at Leveling Rods and Stadia Rods," by Prof. John C. Tracy, New Haven; "Description of Concrete Curbing Constructed at Park Terrace, Hartford," by H. G. Clark, of the city engineer's office; "Completion and Operation of the New Haven Water Co.'s Filtration Plant," by Chas. A. Perry, New Haven; "Substructure of New Connecticut River Bridge, N. Y., N. H. & H. R. R., at Lyme, Conn.," by J. H. Soehrens, resident engineer; "Transverse Contours for Roadway Pavements," by H. H. Gladding, New Haven; "Telephone Subway Construction," by Edward H. Everit, engineer of the Southern New England Telephone Co.; "Some Engineering Features of the Norwich Hospital for Insane," by C. E. Chandler, Norwich; "Methods of Laying Submerged Water and Outfall Sewer Pipe," by F. S. Wardwell, Stamford; "Bridge Work of the New Haven Cut," by C. L. Slocum, assistant engineer N. Y., N. H. & H. R. R., New Haven.

Ohio Engineering Society.

The twenty-eighth annual meeting of the Ohio Engineering Society was held in Columbus, O., January 22, 33 and 24. The interest and attendance was very gratifying. The membership of the society has reached the 200 mark, having doubled in the past three years, although suffering the loss of a considerable number of members by death or removal.

The following officers were elected for 1907: President, A. F. Cole, Marietta; vice-president, Wm. Wilson, Niles; secretary-treasurer, E. G. Bradbury, Columbus. Board of Trustees: Prof. B. E. Trask, Granville; John Laylin, Norwalk; F. E. Meyers, Canton; J. H. Asher, London; R. E. Kline, Dayton.

The section of county surveyors elected

F. M. Kennedy, Washington C. H., president, and John Laylin, Norwalk, secretary. The municipal section elected R. E. Kline, Dayton, president; F. E. Myers, Canton, vice-president, and E. A. Kemmler, Columbus, secretary.

The committee on legislation reported the probable passage of the bill providing for the registration of civil engineers at the next session of the Legislature, and recommended an effort to rectify the confused legislation regarding county surveyors and their assistants passed at the last session.

Other committees rendered interesting reports, notably one looking toward the establishment of standards of accuracy, professionalism and charges. This subject will be placed in the hands of a special committee for development.

The papers prepared were, as a rule, excellent in material and workmanship. Mr. Gage introduced some novel and pleasing suggestions for landscape development, and was followed by Mr. Kline, who described the beautifying of Dayton by the construction of artificial lakes in Great Miami River.

Mr. Wangler advocated the organization of local sections or chapters.

Mr. Kimberly criticised the management of sewage disposal works in the State, and strongly advocated professional supervision of such plants in operation.

Prof. Judd's paper on the Pitot tube was based principally on original experimental work. He finds the coefficient of the tube to vary from unity by a very small fraction of 1 per cent., and his results indicate that the point may be of almost any size or form without affecting the results, provided the velocity of flow is not interfered with:

Other papers were: "Improved Roads in Trumbull Co.," by H. C. White, chairman, Warren, O.; "Roads," by John V. Campbell, Cincinnati, O.; "Contracts and Contractors," by F. M. Kennedy, Washington C. H., O.; "A Reinforced Concrete Wall," by F. A. Bone, Cincinnati, O.; "Compilation and Publication of Property Maps," by F. J. Cellarius, Dayton, O.; "Fuel Economy and Smoke Abatement," by G. W. C. Lomb, Cincinnati, O.; "The Water Purification and Softening Works at Columbus," by Geo. E. Howe, Columbus, O.

Architectural Prizes Offered By the Association of American Portland Cement Manufacturers.

The Association of American Portland Cement Manufacturers invites designs for several classes of suburban dwellings, and offers prizes for the successful designs.

All designs will be judged by a committee consisting of Edgar V. Seeler, architect, Philadelphia, Pa.; Louis H. Gibson, architect, Indianapolis, Ind.; Sanford E. Thompson, civil engineer, Newton Highlands, Mass.

Designs are to be for two classes: Class A, single or detached dwellings; Class B, twin or semi-detached dwellings.

In both classes the use of cement and concrete is desired, wherever practicable. Walls are to be constructed of hollow concrete blocks of plain, paneled or bush-hammered face, but not of rock-face; or they may be of monolithic construction. If hollow blocks are used, interior plastering will be applied directly to the blocks; if monolithic construction, wall furring will be required. Wooden floor joists and roof timbers may be used; roof coverings may be of cement, tiles, slate or shingles. Concrete block partitions, at least for the lower story, are preferred. Chimneys are to be of concrete blocks or brick; the use of cement for posts, cornices, porch railings and other details of simple design is suggested.

A prime requisite of domestic architecture, whether palace or modest dwellings, is that it should possess beauty, charm and appropriateness. The exterior finish of concrete walls has rarely been handled in a way to produce artistic results. The fault does not lie with the material, as it lends itself to a great variety of textures and colors.

The awards of this competition will be made with regard to (1) excellence in artistic quality; (2) convenience of floor arrangements, and (3) economy of construction.

In each class, A and B, designs are desired for dwellings providing the following accommodations: (1) Three or four rooms, 1 or 1½ stories in height, cost not to exceed $2,000; (2) Five or six rooms, 2 stories in height, cost not to exceed $3,000; (3) Seven or eight rooms, 2 or 2½ stories in height, cost not to exceed $4,500. The number of rooms stated does not in any instance include bathrooms, although bathrooms are desired. The costs stated do not include the plumbing and heating systems.

In Class B, the sum stated is understood to be one-half the cost of the double or twin house.

A cellar is necessary under part or whole of house.

Each design must show the plans of all stories above the cellar, three elevations and a section—all at the scale of ⅛ inch per foot. The competitor may substitute a perspective and one elevation for the three elevations if he so desires.

Each design must be accompanied by a brief typewritten statement of materials and method of construction proposed, cu-

bic contents and itemized cost based upon local prices of materials and labor. Cubic contents are to be calculated from the bottom of the footings, up through the entire building, and including porches.

Each design is to be drawn or mounted on white cardboard or Bristol board, not exceeding 18 inches by 24 inches in size. Designs must not be submitted in mats or under glass. The style of rendering is optional; lettering is to be plain Roman. The name and dimensions of each room, the general outside dimensions of the plan and the heights of stories are to be given, and each sheet may bear the title, "Competition for Suburban Houses in Concrete." The class and subdivision of each design is to be shown by lettering, such as "A1," "B2," etc., in the lower left-hand corner.

Drawings are to be enclosed flat, not rolled, and delivered to the secretary of the Association of American Portland Cement Manufacturers, Land Title Building, Philadelphia, Pa., not later than April 1, 1907, and marked on the outside, "Competition for Suburban Dwellings in Concrete."

No identifying mark shall appear on any drawing or wrapper, but each drawing shall be accompanied by a card, bearing the name and address of its author, sealed in a plain opaque envelope and addressed to the secretary. Any competitor who shall in any way violate the anonymity of the competition will be excluded from all participation in the wards.

There will be first, second and third prizes for each of the six classes of designs as follows:

A1 and B1, $100, $60 and $40.
A2 and B2, $150, $100 and $60.
A3 and B3, $200, $125 and $90.

For each additional design awarded honorable mention, not to exceed six in number, $25; not more than two honorable mentions may be awarded in any one class.

Any competitor may substitute as many designs in one or all classes as he may choose, but each design must be wrapped and contain the sealed envelope the same as if submitted by another competitor. The same competitor will not be eligible to receive more than one prize, either first, second or third, in any one class, but he may receive as many honorable mentions as the anonymous judgment of the committee may award.

All designs receiving prizes or honorable mention shall become the property of the Association of American Portland Cement Manufacturers, which shall have the privilege of publishing them with the designer's name attached. Any designer receiving an award will be allowed to photograph or trace his design.

Designs receiving no award will be returned to their authors by the secretary of the association free of expense to the author.

Civil Service Examinations.

The U. S. Civil Service Commission will hold examinations at the usual places on March 6 as follows:

Coast and Geodetic Survey: Draftsman at $700 a year at Washington.

Office of Experiment Stations, Department of Agriculture: Supervising drainage engineer at $2,000 to $2,500 a year; irrigation manager at $1,800 to $2,500 a year; irrigation farmer at $700 to $1,200 a year.

Indian Service: Engineer at Ft. Peck, Agency, Mont., at $720; engineer qualified in acetylene and gasoline gas at Carson, Nev., at $800 and at Arapahoe, Okla., at $720 a year.

Philippine Service: Geologist at $2,000 a year.

There will be examinations March 13 and 14 for topographic and cartographic draftsman for office of Chief of Staff, War Department, at $1,000; also for draftsmen in the Supervising Architect's office as follows: Architectural, at $1,400 to $1,500; junior architectural, at $840 to $1,200; engineer, at $1,600 to $1,800; heating and ventilating, at $1,200 to $1,600 a year.

There will be an examination March 20 and 21 for draftsman and surveyor, office of assistant engineer, twelfth lighthouse district, Honolulu, Hawaii, at $150 a month.

There will be an examination April 3 and 4 for civil engineer students in the Office of Public Roads, Department of Agriculture, at $600 a year.

Technical Meetings.

The annual meeting of the Iowa Electrical Association will be held at Clinton, Iowa, April 18 and 19. L. P. Spinney, Secretary, Iowa State College, Ames, Ia.

The twenty-ninth annual convention of the Illinois Clay Workers' Association was held at Champaign, Ill., Jan. 22, 23 and 24. Officers for the ensuing year were elected as follows: President, W. M. Pratt, Earlsville, Ill.; Vice-President, J. H. Warner, Campus, Ill.; Secretary, Geo. H. Hartwell, Chicago; Treasurer, W. Hammerschmidt, Lombard.

At the recent annual convention of the Canadian Society of Civil Engineers, held in Montreal, officers for the ensuing year were elected as follows: President, W. McLea, Walbank; vice-presidents, M. J. Butler, J. Johnson, J. S. Denis; counsellors, G. A. Keefer, D. McPherson, G. H.

Duggan, C. E. W. Dodwell, C. H. Rust, W. McNab, W. E. Tye, E. V. Johnson, W. H. Breithaupt, J. A. Jamiesen, R. S. Lea, R. A. Ross, John Kennedy, F. P. Gutelius, W. H. Laurie, R. J. Durley, L. G. Papineau, J. Hardman and Dion.

The ninth annual convention of the American Ceramic Society was held in St. Louis, February 4 and 5. Officers for the ensuing year were elected as follows: President, Stanley G. Burt, Cincinnati; vice-president, Ross Purdy, Champaign, Ill.; secretary, Edward Orton, Jr., Coluhbus, O. The National Paving Brick Manufacturers' Association and the National Brick Manufacturers Association, auxiliary bodies, began their sessions February 6.

The seventh annual convention of the Wisconsin Clay Workers' Association will be held at Madison, Rebruary 27, 28 and March 1. J. G. Hamilton, secretary, Grand Rapids, Mich.

The third annual convention of the Iowa Association of Cement Users was held at the Iowa State College, Ames, Ia., January 23, 24 and 25. The papers read and discussed were: "Demonstrations of Cement Tests," by F. C. French, Ames; "The Use of Cement in Drainage," by Engineer A. J. Lilly, Algona; "The New Cement Factories," by Professor S. W. Reyer, Ames; "Cement Post Data," by A. O. Anderson, Lake City; "Standard Sand for Use in Cement Work," by M. J. Reinhart, Ames; "Concrete versus Wood for County Culverts and Bridges," by Jas. Austin Mortland, Montezuma; "Finish for Concrete Surfaces," by H. H. Quimby, Engineer of Bridges, Philadelphia; "Cement and Concrete in Highway Work During 1906," by T. H. MacDonald, State Highway Commission, Ames; "Monolithic construction and Exterior Finish for Buildings," by P. P. Comoli, Sioux City; "Tests of Cement Block," by Professor A. Marston and M. I. Evinger, Ames; "Notes on the Investigations of Cement Mortars and Concretes at the United States Geological Survey Laboratories at St. Louis," by R. L. Humphrey, President National Cement Products Association, Philadelphia; "Selecting the Proportions for Concrete," by William B. Fuller, New York; "Development of the Cement Industry," by R. G. Coutts, Grimnell. The association passed a resolution in opposition to the control of the local cement trade by what they call the lumber trust.

Personal Notes.

J. W. Howard has been elected city engineer at Savannah, Ga.

W. L. Webber has been elected city engineer at Gloucester, Mass.

Peter J. Lamb has been appointed city engineer at Watervliet, N. Y.

J. B. Weddell has been reappointed city engineer at Olympia, Wash.

W. B. Howe has been re-elected city engineer at Concord, N. H.

Paul Schulte has been reappointed city engineer at Fall River, Mass.

Andrew Rinker has been reappointed city engineer at Minneapolis, Minn.

David A. Hartwell has been elected city engineer for the seventeenth consecutive term at Fitchburg, Mass.

Hamilton Flood has been appointed city engineer, and Thomas F. Burke, commissioner of public works, at Quincy, Mass.

H. C. Weber, superintendent of the Weber Gas Engine Company, Kansas City, Mo., died recently at Phoenix, Ariz.

William W. Rousseau, Jr., has been appointed engineer and superintendent of construction of the water-works department, at Troy, N. Y.

Francis H. Wright tenedered his resignation as city engineer, at Helena, Ark., which became effective February 1. Major Charles H. Purvis was appointed his successor.

John N. Parker, of Schenectady, N. Y. has resigned as assistant superintendent of public works of New York State, in charge of the eastern division of the Erie Canal, on account of ill health.

Elbert A. Gibbs, instructor in civil engineering at Cornell University, has resigned to accept a position in the designing and estimating department of the McClintic-Marshall Construction Co., at Pittsburg, Pa.

Frank C. Snow has been appointed city engineer at Findlay, O., to succeed John W. S. Reigle, who resigned to become chief engineer of the Chicago, Lake Shore & South Bend Ry. Co., with headquarters in South Bend.

A. W. Taft, clerk of the street department and secretary of the board of public works, Charleston, S. C., was stricken with apoplexy in his office in the City Hall at noon, February 5, and died at four o'clock that afternoon.

Messrs. Paradis and Thorold, of Calgary, Canada, were, at the last convention of the Union of Municipalities of Alberta, held at Red Deer, January 8 to 10, appointed consulting engineers to the municipalities belonging to the Union.

Dexter Brackett, engineer of the Distribution and Sudbury departments of the Metropolitan Water and Sewage Board, of Boston, Mass., has been appointed chief engineer to succeed Frederick P. Stearns, who resigned to become consulting engineer to the board.

Hon. Charles Tait, mayor of Kingston, Jamaica, died in that city February 10, as a result of injuries sustained at the time of the recent earthquake. Mayor Tait was conducting a meeting of the council when the building collapsed. He was 68 years of age.

Frederick P. Kafka, manager of the New York office of the Unit Concrete Steel Frame Co., has resigned to accept a similar position with the General Fireproofing Co., of Youngstown, O. Mr. Kafka will have full charge of the reinforced concrete department. His address is 156 Fifth avenue.

Harvey Linton, who for nineteen years has been city engineer of Altoona, Pa., has resigned to become principal assistant engineer in charge of location of the Pittsburg, Binghamton & Eastern R. R., which is to construct a new line from Binghamton, N. Y., through Towanda and Canton and Roaring Branch, Pa., to Clearfield, Pa., a distance of 250 miles.

Charles D. Watson has severed his con-

nection with the Roman Stone Co., Toronto, Ont., and has joined the Standard Building and Construction Co., Tenth street and Duquesne Way, Pittsburg, Pa.

William F. Keene has been appointed city engineer, at Central Falls, R. I.

David R. Lyman has been promoted to first assistant city engineer at Louisville, Ky.

E. P. Augur has been elected city surveyor at Middletown, Conn., to succeed R. M. Wilcox.

Roswell L. Gradner, superintendent of waterworks at Springfield, Mass., has been elected city engineer.

John Lindquist, superintendent of the water department at St. Paul, Minn., died recently at his home in that city.

W. E. Parfith delivered a lecture recently before the Engineers' Club of Brooklyn, N. Y., on "Sewage Purification for the City of New York."

William L. Logan, town surveyor of Kearney, N. J., has been appointed city engineer of Summit, N. J., to succeed Edward Rich, who recently resigned.

Col. E. E. Farnsworth has resigned as general manager of the Great Northern Portland Cement Co., at Marlborough, Mich., and is succeeded by W. S. Pritchard, formerly of the Lehigh Cement Co. James C. Kennedy becomes assistant manager.

Robert W. Hunt & Co. have been appointed consulting engineers to the receivers of the Union Traction Company, Chicago, and placed in direct charge of the lowering of the car tunnels under the Chicago River.

Prof. W. D. Pence, M. Am. Soc. C. E., of the Wisconsin State University, is engineer of the Wisconsin State Board of Assessment and the Railroad Commission of Wisconsin, and is making a physical valuation of the Milwaukee street railway properties on behalf of the boards named. Associated with Prof. Pence are: Mr. Bion J. Arnold, M. Inst. E. E., president of the Arnold Co., Chicago, consulting engineer; Mr. C. M. Larson, chief roadway inspector; Prof. John G. D. Mack, M. Am. Soc. M. E., chief mechanical inspector, and Mr. George Weston, chief electrical inspector.

MACHINERY AND TRADE

Block Machine Makers and the Concrete Block Trade.

To the Editor of MUNICIPAL ENGINEERING:

I have just been reading an excellent article in your last issue of MUNICIPAL ENGINEERING and also the one previous on the cement block field, and am much impressed with the sentiment therein contained. The situation is certainly deplorable when we consider the facts as they exist today in the hollow concrete block industry. Hundreds and thousands of hollow block buildings are in existence which are the pride and admiration of their owners and occupants, possessing all the merits which the public concedes they should have, with the possible exception of that high-class architectural beauty which is fast gaining in this respect. The development of machines to accomplish this end has progressed with amazing rapidity, so that those who are educated in this line or work are growing more and more elated as they see the advancement in building with hollow blocks.

In view of this, it is the more depressing to see this most excellent building material, so pliable in the hands of an artisan, so everlasting and incombustible, maltreated and slandered, outraged and murdered, so to speak, by irresponsible and ignorant experimenters, especially when they spread their theories without experience broadcast over the land.

But what shall we say of the advertising mediums who have aided these people in exploiting their cheap and in many cases untried machines? It is not claimed that they have knowingly done so to the detriment of the industry, but in effect it is the same. Consider the situation of the legitimate machine maker as it is today. He is not only beset on all sides by illegitimate competition, but his methods and machines are often slandered, his improvements and patents are ignored, his efforts and statements are disparaged and discredited by those who would force themselves into the block machine business; they call upon the public to buy this or that machine, and to make blocks without any education whatever in the line of work which should and does require years of practice; they ignore the needs of mechanical education and copy and bodily appropriate line after line of expensive catalogues, pictures and all, without knowing the first principles of building or the meaning of literature which they often quote. These they send to the trade journals, who, of course, are anxious to increase their business, and the result is, as has been stated, irresponsible machine vendors trying to sell hundreds of worthless and deceiving machines, producing a few stereotyped hollow blocks which find their way into some uncompromising square buildings without any record of cost, and usually so porous as to unfit them for such purposes. However, nothing daunted a photograph is then secured and published to still further aid in catching the uninitiated. It is just this method which has produced the prejudice in the block business today of which you speak.

In view of this fact it is gratifying to read in some of the journals that these methods are to be eliminated, as far as possible, and that irresponsible firms and quack machines are not desired in their advertising columns. This should be done by all means, and the aid of every practical man in the field is needed all the time to make any showing in the right

direction as stated in the article mentioned.

But often the good which was sought to be accomplished is knocked completely out by illustration and description of a machine for making concrete blocks on a principle which every experienced man knows is not worth one cent for such a purpose, perhaps thousands of dollars having been spent by early investors in the same direction. Why not ask those who have lost so much money in this direction before exploiting schemes which all practical men agree must cause failure and receivership? Again, there may be elaborate advertisement of a machine whose maker swears in answer to an infringement suit that he has made only one and sold none, others are advertised which never came upon the market and still others which are long out of existence.

The fact is, that in this business as in others, many think they have discovered some great thing in other people's business, and rush to the papers to advertise it, when if they only knew what constitutes merit, they would be the very last to make their ideas public, and the papers would refuse to do so. But the money is not in that business; it must come from actual profits derived from good business by practical men. The superiority of hollow blocks over other building material is simply in the saving on account of the hollow space, and the consequent various advantages thereby. It costs just as much to make a good common brick out of Portland cement as it does to make a good clay brick of the same dimensions. Why, then, should we make concrete brick? Practical builders and masons do not and will not advocate these in preference to clay brick unless they can be sold much cheaper, which may be the case under certain conditions in the class of ornamental brick, which can be used in connection with hollow blocks or perhaps common brickwork, but even this is limited. When advertisements are seen advocating machines for making common cement brick, large sills and lintels, long steps and coping, etc., they may attract the uninitiated and visionary, but to the practical mechanic are a dead giveaway of such advertisers.

Even in the use of hollow blocks, in order to save that which is possible on account of the cavity, one must have the best of everything and employ the most economical method of construction. He must have a good knowledge of building construction, and also a knowledge of his machine and its adjustments, so as to co-operate with building plans, etc., after which some progress can be made in this line, satisfaction guaranteed and a saving made to the investor. The lack of some or all of the above things is fatal to success in the block business.

Scores of advertisers who never can pay for the same, thought they could do so out of customers secured from catchy phraseology, and if once started all would be well; but, as stated, the money is not in the business unless everything works from beginning to end in a business-like and systematic manner.

Now how is it with those who have to pay and are good for their debts? Is it not plain that these must pay for the loss of poor accounts? Is it not plain that with cheap and poor machines, which can be sold much less than good ones, and with nothing to pay for advertising the price can be cut so as to greatly handicap legitimate business and prevent the honest man from making the necessary profits to pap his own bills? Is it not a fact that skillful "ad" writers can make cheap and worthless goods appear as good as any, thus diverting not only the profit of legitimate business, but blocking the way of future business?

We do not think it is fair to carry advertisements of devices with no merit in direct competition with reliable firms whose reputation must be sustained and out of whose profits all bills must be paid, nor do we think it is fair to advertise mold-boxes and cast-iron plates to be worked on wooden benches and the like under the name of a machine for making hollow concrete building blocks, the difference of which many are unable to understand. All of these things must be learned before the hollow block business is fully on its feet, and none can do so much good for the industry as the trade journals who will carefully discriminate in their advertising by investigating the practical experience of these people in actual building, many of whom are known to the building trade as entirely out of their place.

One of the very best little articles that I have seen for many days is the answer by you to an inquiry from Virginia asking if any styles of hollow block were moisture and frostproof, and stating that every machine manufacturer claimed that his machine was the only one worth having. Could any question show a more deplorable state of the average block machine maker? But the answer that "many attempts have been made to make waterproof walls without making good blocks" was just and to the point. It is true that block makers have been trying to offset their failures by the use of waterproofing, by the staggered air space, by using two-piece blocks, etc., when the real solution of these difficulties lay in knowing how to make good blocks, and then doing honest work. Good blocks can be made and laid in the wall cheaper than good brick and are better, but the man who undertakes to make money and learn the business by starting at the top and working down will be sadly disappointed and the industry will be set back just that much.

The foregoing is not intended as a reflection on the honesty of purpose or good intentions of the editors of any journals, nor does it seek to abridge their rights to conduct business in their own way; it is rather intended as a help to the trade or even to the inventor. The lines to follow in hollow block building are very straight and will not admit of numerous methods or devices without that complication and cost which is fatal to success and profit. H. S. PALMER.

The writer can not agree with all of Mr. Palmer's propositions and will state some of the reasons therefor, but is glad to present the letter because it gives the views of a practical man who has been through the stages which he so graphically describes, and therefore the conclusions he draws from his experience may be valuable to the designers and would-be sellers of new machines.

This world would be very tame and uninteresting if there were no differences of opinion, and Mr. Palmer will find many who will differ from him as to the value of any one machine or process. Knowledge and judgment are both necessary in order to operate a machine successfully, and personal peculiarities also affect the rate and efficiency with which one can be

operated. What is satisfactory for one, therefore, may be far from satisfactory for another. There must, therefore, be the legitimate differences of opinion referred to, and no one or more persons can arrogate the decision as to what machines shall be placed on the market and what machines shall not. The publisher of a trade journal or of an engineering periodical is not in the nature of things an expert in all the lines which are covered in his advertising pages. He may even, occasionally, be duped, but he must assume, so long as the advertising bills of a customer are paid, that the machine advertised is successful in meeting competition and selling on the market, or that the owner has sufficient confidence in its ultimate success to put money into it.

As stated in the article in the January number to which Mr. Palmer refers, the business department of MUNICIPAL ENGINEERING has cleared out the irresponsible advertisers as rapidly as they have shown their character and will continue to do so.

Mr. Palmer must remember that the concrete block industry is still suffering from the early mistakes of cement block makers to which MUNICIPAL ENGINEERING called attention within the first year, and that the starting of new block factories by ignorant men with poor machines has far less proportional effect at this time than it had at the beginning. The agents of nearly all the machines, beginning with some, at least, of those for Mr. Palmer's own machine, have been responsible very largely, if not altogether, for the failure of block makers to do good work. They began by asserting that any one could make blocks on a machine without experience and they sold machines to whomever would buy, without warning and little or no instruction, for the agent was quite likely to be as ignorant as his customer.

The machine manufacturers themselves have contributed to the result by advertising their machines in daily papers, the monthly literary magazines and in journals going to farmers, carpenters, and other classes of men wholly ignorant of cement and its use. The general advertising of the block as a building material has a place in any magazine of general circulation, but the advertisement of machines, if they are to be sold where they will benefit the trade rather than injure it, should be restricted to mediums which reach men who know how to use cement and who can see the value of a machine and can make blocks which will be right. The advertisers of block machines in MUNICIPAL ENGINEERING have reached this class of men, and it is true also that those who went into the business ignorantly but have persevered, have joined the army of readers of the magazine for the aid which they found in it. These experts and these students have made most of the successes in the block business and have made the bright spots in the picture.

The four to six new patents on machines or blocks issued each week are due largely to the impression gained from the early experiences, that the poor quality of the blocks was due to the machines or to the forms of the blocks, rather than to the quality of materials and workmanship, so each man who fails to make good blocks on an existing machine proceeds to work out a machine which will improve on them, or a new form of block which will offset the defects in their quality.

The large trade in machines for making cement brick is evidence that there are many who differ from Mr. Palmer on the economic advantages as a building material of this form of cement blocks.

MUNICIPAL ENGINEERING is doing its best to supply its readers with the best there is in regard to the subjects of which it treats, and it gives them the information and explanation of principles which will enable them to examine any new proposition understandingly and to select what is good for their conditions. It does not presume to make the selection itself, but places before its readers whatever it can find, believing that they are fully competent, if they will use all the obtainable data before them in the volumes of the magazine, to make decisions which will be nearer the best for their own conditions than any which it can recommend to them. It will always be on the lookout for positive frauds and will eliminate them, but it will not discourage any honest attempts to enter the business field in which it is a factor, because there may be differences of opinion as to the availability or economy of the apparatus or process involved.

The principal effort of this magazine has always been to show the necessity of good materials and workmanship and rapid progress can not be made until all machine and block men join in this effort. It is not attacks upon machines which will secure the great results but attacks upon bad methods of using them.

Instruments for Engineers and Surveyors.

The firm of Young & Sons has been engaged in the manufacture of instruments for engineers, surveyors, astronomers and the like for three-quarters of a century. They are the inventors and introducers of the American transit instrument and the shifting plate for engineers' transits. They have issued their

twenty-second catalogue under date of January 1, 1907, and will send it to any prospective purchaser of transits, levels or other engineers' instruments. The volume contains some history of the origin and development of the transit, an essay on the care of instruments and full descriptions of the various attachments for special purposes, which they can supply for transits of all sorts. A picture is given of the first American transit, made by Young & Sons in 1831. The volume closes with a full treatise on the adjustments of transit, level and attachments and the solar compass, a statement of the theory of the meridian attachment for transit instruments, a history of the evolution of mine surveying instruments and a comparison of the stadia and the gradienter, with full explanation of each. Aside from its value as an instrumental catalogue, therefore, it has a place in the engineer's library for these reasons.

Bermudez Asphalt Does Not Rot in Water.

A remarkable instance showing how a high-grade asphalt laid in the form of a pavement was unaffected by water occurred in connection with the asphalt pavements of Brooklyn. On Morgan avenue a pavement was laid with Bermudez asphalt in July, 1904, by the Eastern Bermudez Asphalt Paving Company. About midway of this strip, where Ten Eyck street leads into it, there is no sewer inlet to permit the surface water to be drained off from the street. That portion of Ten Eyck street leading into Morgan avenue is little more than an alley at present, which may account for the negligence on the part of the city in not providing suitable drainage. Whenever it rains, therefore, the water runs down Ten Eyck street, filling it from the crown to the curb, where it stands until evaporated or until the next storm. Sometimes the storms are so heavy that a stream of more than ordinary force rushes down Ten Eyck street or alley and so across Morgan avenue, and has occasionally washed away portions of the land on the other side of Morgan avenue.

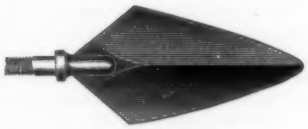
An expert engineer who examined this pavement to ascertain whether it was affected by water or not, found a considerable portion of Morgan avenue just at this point covered with standing water, which apparently was slowly evaporating. He asked a nearby resident how often the street had been totally dry, to which was replied: "The street has not been dry for nearly two years, so far as I know, and I have seen it nearly every day. It has been in the condition you see it in nearly ever since it was laid." The expert made a careful examination of the surrounding pavement and, as far as possible, of the pavement under the water, and was unable to detect any signs of disintegration, which seemed to be very good evidence that Bermudez asphalt was unaffected by water.

This is but another instance corroborating the statement of Prof. Dow when he said that the Bermudez asphalt pavements laid in Washington had never rotted or shown the slightest inclination to rot under the influence of water.

Modern Tools for Sidewalk Work.

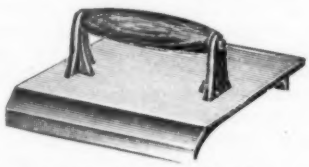
One of the principal discomforts of the sidewalk finisher has been the difficulty of getting over his work with his tools.

Jointer.



Pointing Trowel.

Jointer with Emergency Handle.



Combination Curb Finisher.

CONNELLY'S SIDEWALK AND CURB TOOLS.

All sorts of frames and scaffolds to get him over his work are improvised, and he then must stretch himself and work at great disadvantage. Mr. P. F. Connelly, of Sioux Falls, S. Dak., has taken away all these difficulties by the invention of an adjustable long-handled sidewalk tool, some of the forms and applica-

tions of which are shown by the accompanying cuts.

The long handle, shown in the cut on an advertising page, makes it possible for the cement finisher to stand upright and do his work with greater rapidity and with greater ease, thus making his work much more rapid. Mr. Connelly claims that one man, with this tool, can do the work of five finishers in the old way, and do it better. Wet knees are a thing of the past, as well as worn trousers. The cut referred to shows the surface finishing trowel on the handle. This, as well as the other tools, is adjustable to any desired angle, so that the work can be reached from any point near it and worked right. In the same place is shown the edger, which is designed for use with the same handle, the change being made instantly.

Accompanying this article are cuts showing the jointer and the pointing trowel for use with the long handle. The jointer is also shown with what is termed the emergency handle, for use in special conditions. A combination curbstone finisher, which finishes top, back and front corner at one operation, is also shown.

Mr. P. F. Connelly is a contractor who has been engaged for many years in the laying of walks, floors, curbs and all their adjuncts, as well as in reinforced concrete construction. He is an expert in handling finishing tools, himself, and he has devised these tools and the adjustable handle to meet needs which have developed in his own work. He has tried the tools thoroughly for one or more seasons in his own work, and is confident that they will be as satisfactory for others as they have proved to be for himself.

Hercules Block Machines at Home and Abroad.

The Century Cement Co., of Rochester, N. Y., report a strong demand for the 1907 Hercules, and have prepared for an unprecedented business in 1907. Progress is the keynote of this factory, and the new model shows that improvements have been made wherever possible. The strong points in the machine are its strength, its simplicity of mechanism and the variety of designs and sizes of blocks, sills, lintels and ornaments it can turn out. In many of the large contracts for concrete construction which were completed last year all blocks were made on the Hercules. The immense power house of the New York, New Haven & Hartford Railroad, at Cos Cob, Conn., and a large building for the General Electric Co., at Schenectady, are two instances.

The Hercules has also jumped into favor abroad, for export orders have been plenty during 1906, and machines are in operation in nearly every country in the world. There have just been shipped six Hercules cement block machines to one contractor in Cairo, Egypt. This is the second order from the same contractor, as he has been operating four Hercules machines for two years. It is understood that the last shipment is to be used in making concrete blocks for an elaborate public building of great architectural beauty.

Extension in Use of Waterproofing for Concrete.

The Sandusky Portland Cement Co., Sandusky, O., advise us that their Medusa water-proof compound is being used in the following important work: J. Ogden Armour's private residence, Lake Forest, Ill.; Architect Kahn's private residence, Detroit, Mich. (Mr. Kahn is connected with the Concrete Steel and Tile Construction Co.); P. McManus, Philadelphia contractor, in bridge work at Newton Hamilton, Pa.; Drake & Stratton Co., railway contractors, in tunnel work at Mt. Union, Pa.; Purdy & Henderson, engineers, New York City, in cellar work at Havana, Cuba; A., T. & S. F. Railway Co., Chicago, in the bridge department; Chicago Junction Railway Co., Chicago, in track elevation work; Armour & Co., Chicago, in all their water-proofed concrete work; Central States Bridge Co., Indianapolis, Ind., in White River bridge.

An Effective Dust Layer.

Automobile traffic on macadam highways has depreciated instead of increased property values, on account of the dust which is created by the passage of these vehicles. Sprinkling is a temporary and ineffective remedy, which rapidly destroys the road by erosion, and, in fact, actually helps in the formation of more dust. Various compounds have been advocated to increase the efficiency of water, but these afford very little, if any, improvement. Tarvia is reported by those who have tested it to be an effective remedy. Tarvia gets at the original causes of dust, preventing its formation instead of trying to keep it from rising after it has formed. Tarvia acts as a binder of the top surface of the macadam. It is a heavy, viscid substance, which, when applied hot to the road, permeates the macadam to a depth of about an inch and a half, and acts as a powerful binder to that extent. This layer of the roadway is impervious to water, shedding it like a "duck's back," instead of allowing it to sink in and turn the surface into mud, which afterwards becomes dust. This

same characteristic protects the road against the disintegrating effect of frost, and likewise prevents the tearing away of the road at the gutters by side rivulets. This saving in maintenance of macadam roads, it is claimed, more than repays the original cost of an application of tarvia. A booklet on the subject will be sent on request by the Barrett Manufacturing Co., New York City.

The Demorest Concrete Mixer.

There have been many attempts to make a continuous automatic concrete mixer. One of the latest of these, whose successful operation at the recent cement users' convention was favorably commented upon, is the Demorest, which is made by the Ballou Manufacturing Co., Belding, Mich.

The design of the machine is simply described in the catalogue of the company as follows:

The sand runs from the sand hopper to the feed belt. The cement runs from the cement hopper to the same belt. This belt is made of one solid piece of strong, durable belting, and carries both cement and gravel to the mixer.

The amount of sand and cement running to the belt can be regulated to a nicety to any proportion by manipulating little slides or gates, which can be raised or lowered as desired.

After reaching the mixer, which is a large revolving cylinder or drum 4 feet long and 16 inches at the discharging end, the sand and cement are very thoroughly mixed dry.

This is one of the greatest secrets in the making of good concrete.

On the inside of the mixer are six ribs of three-fourth inch angle iron, riveted in a spiral form inside of a drum. These ribs are located 14 inches short of the discharging end of the cylinder, and assist greatly the dry mixing.

After the cement and sand are thoroughly dry mixed, they come in contact with 15 sprays of water, which wet them thoroughly while revolving. To keep the concrete from sticking to one side of the cylinder, a steel blade projects inside of the drum, cutting the wet mixture from the sides, keeping them clean, and improving the wet mixing.

At the same time, on the inside of the drum, is an automatic hammer that strikes the exterior at each revolution, jarring everything that has a tendency to cling to the inside.

The water supply comes from a heavy galvanized water tank directly above the cylinder or mixer, and is governed to a nicety by a 1-inch globe valve.

There are several little practical devices about the machine which keep the material moving through the hoppers and through the mixer, which are the results of much experiment, and they seem to overcome the objections to many continuous mixers on the ground that they are not continuous, because of stoppages occurring at various points on the course of one material or another.

A catalogue showing hand and power mixers built on the same design as far as the mixer is concerned will be sent on application to the Ballou Mfg. Co., Belding, Mich.

The Thermit Rail Joint.

The Goldschmidt Thermit Co., 43 Exchange Place, New York City, have issued a pamphlet which outlines in the simplest way their process for welding steel, especially rails in track. A welding gang consists of a foreman, who supervises the work and charges and taps the crucible, a man who heats and cleans rail ends and shims open joints, two men who set and remove molds and crucibles and a man who fills and dries mold boxes in the shop. These five men will make twenty to twenty-five joints a day, traffic being maintained during the welding operations. The rails are lined and surfaced, the joints are heated and cleaned, and the molds are placed around the joint and luted. The crucible is set on its tripod and charged. The ignition powder is lighted by a match, which starts the chemical reaction of thermit, and in half a minute produces a heat of 5,000 degrees in the steel, which is then run into the mold surrounding the base and web of the rails. The rail ends are thus welded together and fused with the steel of the reinforcing collar, which is about ¾-inch thick, 2½ inches broad, and weighs two-thirds of a pound.

The pamphlet shows special problems and how to solve them, and surprises the reader with the small proportions of the outfit necessary to do the work. It will be sent on request sent to the address given above.

New Branches of the Link-Belt Company.

By locating a branch office at 321 Ellicott Square Building, Buffalo, N. Y., the Link-Belt Company, of Philadelphia, Chicago and Indianapolis, is in a better position to give personal attention to customers of its drive chain department in Buffalo and neighboring territory of New York, Pennsylvania and Ohio. The facilities of the company in the manufacture of the "Renold" silent and other forms of power-transmission chains are tendered through its representative, Mr. H. C. Minier.

No. 440 New York Block, Seattle, Wash., Mr. E. G. Brabrook in charge, is a new branch office of the Link-Belt Company, of Philadelphia, Chicago and Indianapolis. Increasing business from the far West, Washington, Oregon and surrounding territory, in the conveying-machinery manufactured by the company,

made personal representation on the Pacific Coast desirable. Seattle was selected as the most advantageous location.

Manufacture of Paper Cement Bags.

Paper bags are becoming popular for shipping Portland cement and may become still more popular since it is now possible for the cement manufacturers to make their own bags at low cost, saving, it is said, much of the cost of the packages for cement. On an advertising page will be found pictures of the machines for making paper bags, which are manufactured by Matthew Vierengel, 32 South Sixth street, Brooklyn, N. Y. One is a tubing machine, which takes the paper from the roll, forms it into a tube, pastes the seam and cuts off the tube in the required uniform lengths. This machine runs at a speed of 120 a minute. The shorter machine is used for putting the bottoms in the bags, taking the tubes from the other machine and enclosing their bottoms. The complete machines are capable of changes to make bags of various sizes and forms, but for a cement mill the ¼-barrel sacks will probably be sufficient and a machine for one size is much less complicated and is consequently cheaper in first cost and in maintenance. It can be operated by men who are not expert mechanics.

The machines above described make the plain sacks, which are printed after they are made. Mr. Vierengel builds a machine which takes the paper from the roll and turns out a complete bag with the label printed on it.

Mr. Vierengel has been making paper-bag machines for many years and is only now proposing to sell them directly to the cement manufacturers individually. He offers a bonus to the first cement manufacturer who equips his plant with the machines, because he believes that the trial of the method by one will lead the others to the same practice. Roll paper takes up little space and the sacks can be turned out from day to day as they are needed. Storage of sacks and barrels thus becomes a thing of the past, and many plants which are cramped for room can use their cooperage plant for other purposes, a small part of it only being necessary for the paper-sack machine installation, the storage of the roll paper and of the small extra supply of finished sacks. Application to Matthew Vierengel, 32 South Sixth street, Brooklyn, N. Y., will bring full details of his offer.

A Barrow for Concrete.

A new barrow for handling concrete has been put on the market by the Puffer-Hubbard Manufacturing Co., Minneapolis, Minn., which was designed from suggestions made by large contractors asking for a concrete barrow from this long-established firm in the manufacture of wheelbarrows, carts, tanks, silos, etc. The contractors demanded a very strong barrow, with a roomy tray, and this has been supplied, the tray holding four cubic feet and having a high front to make the load carry level. The trays are of steel, with double reinforced corners, thoroughly riveted. They will not crinkle or drop down, as in pressed trays drawn out thin in places. The handles are of wood, long, and held together in front of the wheel by a bolted steel yoke, which also serves as a nose to dump the load when the barrow is tipped forward. The yoke also has eyes through which the axle bolt passes. The wheel is of malleable iron, with heavy non-turning axle bolt. The legs or shoes are of channel steel, and are braced together across the rear. The barrow is reported to be in the hands of numerous contractors, who speak in the highest terms of it. Full information will be supplied by the company on application to their Minneapolis office.

The Brooklyn Municipal Asphalt Plant.

On November 21, 1906, bids were opened in the office of Bird S. Coler, president of the Borough of Brooklyn, City of New York, for the building and installation of a municipal asphalt paving and repair plant. At this time Hetherington & Berner were the low bidders, their proposal being for $16,500, the high bidders being Warren Brothers Co., whose bid was for more than $23,000. After considering the proposals, they were all declared informal by those in charge of the business for the city, and new bids were called for by re-advertisement. The second lot of proposals were opened December 19, 1906, and this time Hetherington & Berner were again the low bidders, at $21,600, the next highest bidder being the Warren Brothers Co., whose figure was $22,485. The contract was let to Warren Brothers Co., of Cambridge, Mass., at their price, the statement being made that the Hetherington & Berner bid was informal.

Inquiry regarding the details of the transaction has brought out the following facts: President Coler, of the Borough of Brooklyn, declared the Hetherington & Berner bid informal, "in that the bidder substituted and incorporated in their tender to the city a proposition to make substantial modification of the work definitely called for in the city's advertisements and specifications. One of the requirements of the specifications was for

a fireproof structure throughout, with steel frame. The bidders named proposed to instal a gravel roof over the boiler and engine equipment, and also proposed to complete the work at fifteen days beyond the time set by the specifications, and made other stipulations which are distinctly irregular, failing also to attach the certificate of a notary required in the proposal."

Mr. Hetherington does not agree with the borough president with reference to the first two points named, since his bid on roof was alternative and permitted the gravel or "other satisfactory roofing material;" also, while his bid fixed the latest date for completion fifteen days after the date called for in the advertisement, this failure to complete at the advertised time would only subject him to the specified penalty of $25 per day for failure to complete at the advertised time. He admits the omission of the notary's certificate. These technical informalities are the only reasons appearing for the rejection of the lowest bid, and it is understood there will be no further contest over the matter.

Trade Publications.

Cement-making machinery is fully described and illustrated in the new catalogue No. 2 of the Power and Mining Machinery Co., Milwaukee, Wis.

The Jeffrey Manufacturing Co., Columbus, O., issue two of their handsome circulars, illustrating two classes of coal and ashes handling machinery for power plants.

A recent circular of the Standard Asphalt and Rubber Co., 218 La Salle st., Chicago, Ill., gives a full list of the uses to which their products are put, and is accompanied by a very interesting report by W. H. Bennett on the uses of mineral rubber and the qualities which make it useful.

Catalogue No. 21, of the Chicago Pneumatic Tool Co., Fisher Building, Chicago, Ill., shows in detail the air-cooled Duntley electric tools, including electric drills, grinders, drilling stands, magnetic oldman hoists, etc., a most complete line of drilling tools.

Pamphlet No. 9, of the Chicago Portland Cement Co., 1016 Chicago Stock Exchange Building, Chicago, Ill., illustrates a number of important structures in which Chicago A A cement has been used, and indicating the satisfaction it gives for many and varied conditions.

Trade Notes.

ASPHALT.

Cincinnati, O.—City Solicitor Lowman has been directed to prepare an ordinance providing for the issue of $40,000 bonds for a municipal asphalt repair plant, as recommended by City Engineer Danenhower.

CEMENT.

St. Cloud, Minn.—John McElroy is endeavoring to interest capital in the deposit of marl which lies near this city, with a view to establishing a cement plant.

Chicago, Ill.—B. L. Swett, formerly with the Atlas Portland Cement Co., has resigned and accepted a position as western sales agent for the Lehigh Portland Cement Co., with headquarters at the Great Northern Hotel, Chicago.

Livingston, Mont.—The establishment of a cement mill here next summer is proposed by the General Electric Company interests, which have been investigating the available materials.

Fort Dodge, Ia.—The general western sales office of the United States Gypsum Co. was removed from here about February 15 to Minneapolis. F. W. Farrington will continue in charge of the western sales office, with offices in Minneapolis. No change was made in officers or representatives.

Mitchell, Ind.—The warerooms and packing house of the Lehigh Portland Cement Company's mill No. 2, located here, was destroyed by fire recently, causing a loss of more than $300,000.

Lagrange, Ind.—The syndicate that owns the Grass Lake marl deposit is being urged to build its cement plant here. The company would have to haul its raw materials 5 or 6 miles, but as this is the county seat, it naturally is more convenient as a business headquarters.

Marysville, Kan.—The erection of a gypsum mill in Marshall county, near Irving, is contemplated. Matt Wacek, of Irving, is interested.

Emporia, Kan.—A number of men of this city are considering the establishment of a cement plant at Elmdale.

St. Louis, Mo.—The merger of the St. Louis Portland Cement Co. with the Union Sand & Material Co. was effected February 8, according to press reports of that date.

Perth Amboy, N. J.—Plans are being considered for the improvement and enlargement of the plant of the New Jersey Cement Co., at an expenditure of about $30,000.

Alpena, Mich.—The plant of the Alpena Portland Cement Co. was almost completely destroyed by fire February 19.

Portsmouth, O.—According to press reports of Feb. 16, Geo. A. Beaton, New York, will re-engage in the cement business in southern Ohio.

CONCRETE BLOCKS.

Auburn, Neb.—The Auburn Stone Co. will enlarge its concrete plant and add considerable machinery.

Des Moines, Ia.—The Peru Stone & Cement Co. has been incorporated to manufacture rubble, riprap, and crushed stone.

Hampton, Ia.—The Hampton Cement Construction Co. contemplates enlarging its business and engaging in the tile business.

Detroit, Minn.—The Holmes Artificial Stone & Brick Co. purchased a compressor and sand tampers of the Chicago Pneumatic Tool Co. through Geo. M. Kenyon, of St. Paul, the company's agent.

Little Rock, Ark.—The Arkansas Corrugated Metal Culvert Co. has been incorporated to manufacture a patent corrugated metal culvert. The plant will be in operation April 1. The officers of the companp are: President, C. C. Fouts;

vice-president, W. H. Johnson; secretary, J. P. Lang; treasurer, E. L. Stuben. Directors: Hugh Morris, F. O. Putney, R. R. Williamson.

Fayetteville, Ark.—The Cement Building Block Co., of this city, has discovered a material in the western part of Washington county, near Lincoln, which seems to be superior to the material from which Portland cement is made. Blocks made of the material are very successful.

Chico, Cal.—The Chico Construction Co. has established a plant here for the manufacture of concrete blocks and cement brick. The officers of the company are: President, F. A. Clough; vice-president, J. C. Smith; secretary, C. A. Truitt; treasurer, J. R. Graves; manager, W. A. Perley.

Los Angeles, Cal.—The Chamber of Commerce will investigate a proposition to erect concrete telegraph and telephone poles here.

Athens, Ill.—Charles Canterbury and David Hicks have dissolved partnership in the cement block factory, and Mr. Hicks will continue the business.

Vernon Center, Minn.—Roy Faley contemplates installing a tile plant here.

Grundy Center, Ia.—The Grundy Center Brick & Tile Co. has been incorporated by H. C. Ady, Henry Frerichs and E. A. Cravy.

Pittsburg, Pa.—Special.—Charles D. Watson advises us that he has joined a large company in the Eastern States for the manufacture of Roman stone and factory-made structural concrete. Address, care Standard Building & Construction Co., Tenth street and Duquesne Way, Pittsburg, Pa.

New concrete block companies: Odebolt, Ia.—Henry Hanson, cement block and fence post plant; Pella, Ia.—Den Adel and Vander Heiden; Rhinelander, Wis.—H. J. Samways and Jules Demars; Janesville, Wis.—B. Chase; Hudson, Wis.—The Stillwater Stone Sidewalk Co.

Chicago, Ill.—The Ayer & Lord Tie Co. contemplates the erection of a creosoting plant for the treatment of ties and bridge timbers for the Rock Island road at or near Little Rock, Ark.

Gladstone, Ill.—The Gladstone Sand & Concrete Co. has been incorporated by Conrad Lilteich, George Littleton and G. A. Begeman.

Monterey, Minn.—R. H. Worthley and C. Worthley will form a partnership for the manufacture of cement blocks, posts and tile.

Scotch Plains, N. J.—The Fanwood Stone Crushing and Quarry Co. has been incorporated by Wm. H. Weldon, of Rahway; Franklin E. Weldon and John Hetfield, of this place.

Garden City, Kan.—The Perfection Block Mfg. Co. has been organized to manufacture cement blocks by the Dow process. The company expects to be manufacturing blocks by March 10.

Reading, Pa.—The Reading Cement Inlaid Tile Co. has been incorporated to manufacture and deal in cement and tiling of all kinds.

Cincinnati, O.—The Cincinnati Cement Concrete Co. has been incorporated by W. E. Smith, Jay Brown, J. B. Pugh, W. A. Stone and M. M. Beatty.

Oregon, Ill.—The Rock River Concrete Construction Co. has been incorporated by Lambertus Wannolts, Leon L. DeWar and William Irwin.

East St. Louis, Ill.—The Union Stone Lime Co. has been incorporated to quarry, mine and manufacture by Melville B. Coburn, Thomas Fedete and William D. Coburn.

Springfield, Ill.—The J. L. Fortado Co. has been incorporated to deal and contract in stone, cement and brick, by J. L. Fortado, E. F. Lomeino and John H. Barger.

Crookston, Minn.—The Williamson Cement Block Co. has been incorporated by Wilhelm and Will Johnson.

Albany, Ind.—The Indiana Cement Post Co. has been incorporated by R. F. Brammer, L. H. Stoner, W. E. Barlow, C. W. Martin, L. R. St. John, Thomas Booher and David Kaufman.

PURCHASE OF MACHINERY.

South McAlester, I. T.—Special.—I. A. Gordon, Mountain House, desires prices and information on dump carts, stone crushers, and engine and boiler for operating same.

Arequipa, Peru, S. A.—Special.—Julio Andres Arce, C. E., engineer and contractor, postoffice box 90, advises us that he is in the market for quarry machinery, including drills, saws, planers, grinders and polishers and window frames for a large hospital.

Chalybeate Springs, Ga.—Special.—Morgan Brown, Express office, Warm Springs, Ga., advises us that he is in the market for a general line of concrete machinery and tools.

Lebanon, Pa.—Special.—Geo. W. Hays, C. E., desires to purchase drawing and engineering materials.

Winchester, Ind.—Special.—Alonzo L. Wright is in the market for graders, wheel scrapers, concrete mixers and scoops.

PURCHASE OF MATERIALS.

Chalybeate Springs, Ga.—Special.—Morgan Brown, Express office, Warm Springs, Ga., advises us that he is in the market for lime, Portland cement and waterproofing, and a general line of building materials.

Brandon, Man.—Bids are asked until April 11 for supplying 6,000 to 8,000 barrels of Portland cement. W. H. Shillinglaw, cy. engr.; Harry Brown, clk.

Washington, D. C.—For furnishing reinforced concrete, steel, etc., see "Waterworks Contracts to Be Let."

Wheeling, W. Va.—Sealed bids are asked until March 12 for furnishing and delivering iron and steel for bear-trap gates for Dam No. 13, Ohio River. F. C. Boggs, capt. engrs.

New York City.—Sealed bids are asked until March 11 for furnishing and delivering piling and road timber, square timber and lumber, paving stone, tie rods, spikes, etc., for constructing and repairing dikes in the Hudson River. D. W. Lockwood, col. engrs., Army bldg.

Winchester, Ind.—Special.—Alonzo L. Wright is in the market for cement, sewer pipe and paving blocks.

LIGHT, HEAT AND POWER.

Peoria, Ill.—The Illinois Acetylene Lighting & Mfg. Co. has been incorporated by Chas. E. Blackburn, Franklin C. Nickel and Alvin Taylor.

MISCELLANEOUS.

Wilkesbarre, Pa.—The Lucerne County Crushed Stone Co. has been incorporated by D. L. Craveling, J. Q. Creveling, P. A. Meixell, Christopher Wren and J. W. Davis.

Little Rock, Ark.—The Charles M. Newton Trap Rock Co. has been incorporated by Chas. M. Newton, Oscar Davis and Walter J. Terry.

Norfolk, Va.—The Dozier-Davis Corporation has been incorporated to contract business, erect buildings, grading, etc., by W. L. Davis, president; E. W. Dozier,

treasurer, and R. M. Hudson, all of Norfolk.

Albany, N. Y.—The Panama Construction Co. has been incorporated to finance the Panama contract secured by William J. Oliver, of Knoxville, Tenn. The company's principal office will be in New York City. The directors named are: John B. McDonald, John Peirce, Robert A. C. Smith, William H. Sayre, George F. Harriman, all of New York City; William J. Oliver, of Knoxville, Tenn.; C. H. Akert, Robert A. Chester, Patrick J. Brennan, of Washington; G. Peirce, of Frankfort, Maine; Patrick T. Walsh, of Davenport, Ia., and Robert R. Russell, of Lynchburg, Va.

SEWER PIPE.

Fort Dodge, Ia.—The Plymouth Clay Products Co. has been incorporated to make sewer pipe, drain tile, etc.

Minneapolis, Minn.—Nelson Bros. Paving & Construction Co. have completed a shop in Columbia Heights for the manu-

Patents Concerning Cement and Its Uses.

832,101. Machine for Making Artificial Stone Blocks and the Like. Richard Titus and Frank J. Mearing, Bowling Green, O.

832,218. Fence Post. John C. Speaker, Magnolia, O.

832,300. Cistern Form. Edward J. Dunn, Indianapolis, Ind.

832,441. Machine for the Manufacture of Building Blocks. Zacharias Anderson, Minneapolis, Minn.

832,539. Concrete Fence Post and Wire Fence. George T. Davis, Ames, Ia.

832,557. Reinforcing Concrete Construction. Geo. L. Peabody, Pittsburg, Pa.

832,583. Reinforce Bar for Concrete Floors and Beams. Joseph Babiczky, Kansas City, Mo.

832,594. Fence Post Mold. Wm. R. Collier, Beaumont, Tex.

823,637. Machine for Molding Concrete Building Stone. Remus E. Taylor, Oakland, Kan.

832,645. Brick Molding Apparatus. Peter P. Welty, Columbus Grove, O.

832,690. Machine for Making Building Blocks. Wm. F. Morse, Rochester, N. Y.

832,694. Artificial Stone Building Block. Elmer P. Newman, Denver, Col.

832,722. Mixing Machine. Roy N. Cunningham and John W. McPherson, Columbus, O.

833,010. Apparatus for Making Artificial Building Blocks. Howel Thomas, and Chas. E. Delime, Watertown, N. Y.

833,014. Mixing Machine. Jos. F. West and Wm. O. Cowley, Wichita, Kan.

833,019. Cement Chimney Top. Silas Bice, Gloversville, N. Y.

833,127. Cement Fence Post. Edward Dehler, Womewoc, Wis.

833,367. Cement Burial Vault. Albert E. Beall, Clinton, Ia.

833,419. Mold for Molding Building Blocks. Frank M. Sawyer, Charlotte, N. C.

833,461. Floor, Sidewalk and Like Construction. Peter H. Jackson, San Francisco, Cal.

833,532. Cement Facing Slat. Xenophon Kuzmier, New York, N. Y.

833,623. Gutter Curb and Means for Protecting Curb Angles. John W. Parker, Mexico, Mex.

833,625. Brick Machine. Robert B. Pfister, Great Bend, Kan.

833,629. Molded Stone Building Slab. Orvey Price, Plainfield, N. J.

833,675. Device for Making Artificial Stone. Samuel S. Cheezum, Terre Haute, Ind.

833,701. Mold. John Strait, Jakob Brahm and Elmer E. Strait, Rock Rapids, Ia.

833,721. Concrete Block. Wm. Kupper, Cleveland, O.

833,790. Mixing Machine. Wm. Miles, Jackson, Mich.

833,791, 833,792. Construction and Sinking of Caissons or the Like. Daniel E. Moran, Menkham, N. J.

833,836. Block Mold. Joseph Julian and Geo. Brooks, Oglesby, Ill.

833,851. Railroad Tie. Wm. O. Smith, Detroit, Mich.

833,882. Apparatus for Making Fence Posts. Geo. A. LeFevre, Orangeburg, N. Y.

833,894. Mold for Concrete Structures. John Preston, Walker tp., Kent Co., Mich.

833,913. Railroad Tie. Edwin H. Bell, Chicago, Ill.

833,918. Apparatus for Producing Cement. Rolla C. Carpenter, Ithaca, N. Y.

833,952, 833,953. Molding Machines for Forming Bricks and the Like from Plastic Material. Geo. Brown, Niles, Mich.

834,052. Block Mold, Joe A. Gibson, Buffalo, N. Y.

834,155. Block Molding Machine. Geo. E. McArthur and Clarence P. Springer, Eaton Rapids, Mich.

12,542 (reissue). Concrete Block Machine. Wm. S. Barker, Toledo, O.

834,322. Subway or Tunnel Construction. Richard W. Raftis, Chicago, Ill.

834,374. Manufacture of Hydraulic Cement and the Apparatus Therefor. Bernard Enright, South Bethlehem, Pa.

834,448. Fence Post Mold. Isaac G. Brooks, Wabash, Ind.

834,617. Molding Device. James P. Hall, Jersey City, N. J.

834,632. Apparatus for Molding Building Blocks. Andrew Nelson, Rock Island, Ill.

834,804. Fence Post. Andrew J. Heninger, Tazewell, Va.

834,847. Machine for Forming Hollow Blocks. Wm. Polk, East Liverpool, O.

834,954. Mold for Making Building Blocks. John Wengs, Monroe, Mich.

835,027. Concrete Building Block. Arlando Lough, Estherville, Iowa.

835,088. Concrete Roofing. Orlin J. Wilder, Grand Rapids, Mich.

835,140. Machine for Molding Building Blocks. Ole H. Olsen, Rock Rapids, Ia.

835,159. Art of Constructing Lining Walls for Shafts Excavated in the Earth.

835,175. Mold for Ornamental Artificial Stone. Asahel L. Bemis, Pueblo, Colo.

835,201. Brick Machine. David P. Sanders, Reading, Pa.

835,241. Concrete Window Construction. Frank B. Gilbreth, New York, N. Y.

835,405. Building Block Machine. Mark L. and John Dahn, Baltimore, Md.

835,524. Centering Construction. A. L. A. Himmelwright, New York, N. Y.

835,669. Building Block. Matthew Eckley, Archbold, O.

835,674. Brick Machine. Stephen S. Gardiner, Lincoln, Neb.

835,717, 835,718. Material and Column for Building Construction. Geo. F. Thorn, New York, N. Y.

835,719. Fence Post. Joseph W. Westlake, Marysville, O.

835,723. Reinforced Concrete Covering for Structural Members. Robert Anderson, Cincinnati, O.

IMPROVEMENT AND CONTRACTING NEWS

PAVING.

Knoxville, Tenn.—The Barber Asphalt Paving Co. began work Feb. 19 on the paving of District No. 1 of Church avenue from Prince to Heinley street.

CONTEMPLATED WORK.

Mt. Pleasant, Ia.—Paving is contemplated.

Webster City, Ia.—Council is considering paving.

Jackson, Mich.—Paving is contemplated for East Main street.

Superior, Wis.—North Sixteenth street may be paved with macadam.

New Castle, Pa.—Brick paving is proposed for Gardner avenue.

McLeansboro, Ill.—Street paving is assured. Mayor Hogan.

St. Paul, Minn.—Macadam paving on Grand avenue is contemplated.

Green Bay, Wis.—Macadam paving is contemplated for State street.

St. Joseph, Mo.—A new boulevard is contemplated. Mayor Spratt.

Randolph, Wis.—Voted to issue $40,000 street improvement bonds.

Poughkeepsie, N. Y.—Main street is to be repaved with vitrified brick.

Columbus, Ga.—Bids will be asked for paving 22 blocks of streets.

Brandon, Minn.—Cement sidewalks on several streets are contemplated.

Kalamazoo, Mich.—Eleanor street will be paved with brick. M. C. Taft, cy. engr.

Sioux City, Ia.—The construction of 1 mile or more of paving is contemplated.

Sedalia, Mo.—Plans are being prepared for brick street paving. City Clerk Baker.

Boyestown, Pa.—The question of issuing $30,000 for street paving will be voted on.

Dallas, Tex.—North street from Carroll to Fitzhugh will be paved with Jacksboro rock.

Council Bluffs, Ia.—The question of paving West Broadway with brick is being agitated.

Carthage, Mo.—Plans for 14 blocks of paving have been prepared by Wm. Kohlman, cy. engr.

St. Catharines, Ont.—The construction of permanent roadways in this city is contemplated.

Hartford, Conn.—Asphalt paving is contemplated for Asylum street from Main to High during 1907.

Spokane, Wash.—A petition is being circulated asking that Olive avenue be paved with "Oilroad."

Springfield, Ill.—Asphalt paving is contemplated for Monroe street from Glenwood to Douglas avenues.

DePere, Wis.—A resolution has been adopted to pave Broadway street from William to Lewis with brick.

Webb City, Mo.—Bids will be received about March 1 for 6 blocks of brick paving. W. E. Smith, cy. engr.

Franklin, Ind.—Estimates are being prepared for paving West Jefferson street. Otis B. Sellers, cy. engr.

Corry, Pa.—Bids will be asked about April 1 for paving 2 blocks of Central street. N. P. Dickson, engr.

Shenandoah, Ia.—Grading and curbing are contemplated for several streets and paving for Clarinda avenue.

Bristol, Va.—The question of expending $50,000 for improving the streets during 1907 is being considered.

Lebanon, Ind.—Plans are being prepared for 14,000 square yards of brick paving. John W. Fulwider, cy. engr.

Toledo, O.—A petition has been filed with council for repaving Huron street from Jefferson avenue to Adams street.

Escanaba, Mich.—D. A. Brotherton, cy. engr., has prepared plans and specifications for paving certain streets.

Carterville, Mo.—Plans have been prepared and bids will be asked for 7 miles of cement walks. L. M. Janes, mayor.

Marietta, O.—Plans are being prepared and bids will be asked about April 1 for 3 miles of paving. A. F. Cole, cy. engr.

Springfield, O.—W. H. Sieverling, cy. engr., will prepare estimates for paving West Main, S. Center and S. Yellow Springs streets.

Fredonia, N. Y.—Bids will be asked soon for repaving Central avenue from Temple street to the city line. Jas. P. Morrissey, cy. engr.

Celina, O.—Plans are being prepared and bids will be asked for constructing the Henry Will pike, about 6 miles in length. M. Lutz, co. surv.

Joplin, Mo.—This city contemplates paving Joplin street from Sixth to Tenth with brick. W. W. Van Frank, cy. engr.

Akron, O.—Plans for paving 6 streets with brick and Medina stone are being prepared. J. W. Payne, cy. engr.

Kenosha, Wis.—Bids will be asked about April 15 for paving Holland and Salem avenues with brick. Robt. Moth, cy. engr.

St. Joseph, Mo.—An ordinance has been introduced to pave 24th street from Felix to Messanie with Hassam concrete blocks.

Waterloo, Ia.—The city engineer will prepare estimates for 83,000 square yards of paving and 39,347 lin. ft. of new curb and gutter.

Philadelphia, Pa.—The citizens of Germantown are urging the paving of Greene st. from Manheim to Tulpehocken with wooden blocks.

Pine Bluff, Ark.—The property owners have organized a district and propose to pave W. 12th ave. from Main to Olive with asphalt.

Hamilton, O.—Cy. Engr. Dillon will prepare plans for paving N. B and S. D sts. with asphalt, bituminous macadam or vitrified brick.

Hempstead, L. I.—The question of appropriating $20,000 for paving Main and Front sts. with brick will be voted on in March. Vil. trustees.

Jamestown, N. Y.—Estimates have been submitted for paving Newland ave., W. 2nd st. and Mechanics alley with brick. Clyde G. Jones, cy. engr.

Bridgeton, N. J.—The Bridgton & Millville Traction Co. contemplates paving between their tracks on Atlanta st. between Broad and Vine.

Oklahoma City, Okla.—The property owners on N. Walker and W. 14th and

15th sts. are having the curbing laid preparatory to paving with asphalt.

Lebanon, Va.—The Russell Co. commissioners have decided to construct 8 miles of macadam road from Cleveland to this city. T. J. Gilmer, chm., Lebanon.

Savannah, Ga.—Harry Willink, director of public works, has written to more than a score of cities asking what method they adopt for keeping up asphalt streets.

Franklin, Pa.—Ordinances have passed first reading providing for the paving of 14th, 8th, Otter, W. Park and Elk sts. with block, wire-cut brick or asphaltum block.

Crawfordsville, Ind.—Cy. Engr. Shrum has been directed to prepare plans and specifications for paving E. Wabash st. from the Monon to the Vandalia railroad tracks with brick.

Birmingham, Ala.—An ordinance has been passed to pave 22nd st. from Avenue A to Avenue B with bituminous macadam and vitrified brick. Geo. B. Ward, mayor; J. C. Murray, cy. clk.

Davenport, Ia.—The cy. engr. is preparing estimates and contracts will be let by May 1 for paving 3rd, 15½, 23rd, 19th, 13th, 21st and 14th sts. and 6th ave.

Atlantic City, N. J.—City council has notified the officials of the Pennsylvania railroad that legal steps will be taken to compel that corporation to pave and repair Mediterranean ave.

La Crosse, Wis.—Contracts will be let about March 20 for 40,000 sq. yds. of granite-top macadam, 2,700 sq. yds. of brick, and 9,220 sq. yds. of cresoted wood block paving. W. S. Woods, cy. engr.

Los Angeles, Cal.—An improvement association has been organized with M. L. Wicks as president, to create a model six-mile boulevard out of Sunset Boulevard from the old Hazen to Hollywood.

Canton, O.—Plans and specifications are being prepared for grading, curbing and constructing 18,500 lin. ft. of stone and cement sidewalks, and 14,350 lin. ft. of brick block paving on 7 streets.

Ft. Wayne, Ind.—Plans have been completed for 13,700 sq. yds. of brick paving on N. 8th st.; 10,400 sq. yds. brick paving on Maple ave.; 14,000 sq. yds. brick paving on 21st st. E. B. Schmidt, cy. engr.

Buffalo, N. Y.—Brick paving on concrete base is contemplated for Lovejoy st. from Sweet ave. to Curtis st. Bids will be asked for paving Roader st. with different kinds of materials. Francis G. Ward, commr. pub. wks.

Atlantic City, N. J.—A resolution has been passed providing for the construction of one block of tile decking on the Boardwalk along the trial square of wooden block, in order to test the wearing qualities of the two materials.

Oshkosh, Wis.—Paving is contemplated as follows: Northwestern ave. from Mt. Vernon st. to Chic. & Northwestern depot, asphalt; W. Algoma st. from Algoma to Pearl sts., tar macadam; Hazle st. from Washington to Merritt sts., tar macadam.

Duluth, Minn.—Bids will be received soon for paving Jefferson st. from 13th to 22nd ave. with sandstone or granite curbing. Estimates will be prepared for paving 4th ave., W. 4th st. and Lake ave. with sandstone, macadam and creosoted blocks.

Albany, N. Y.—Western ave. is to be improved.

Puyallup, Wash.—Asphalt paving is contemplated.

Boone, Ia.—Brick paving is contemplated for 8th st.

Beardstown, Ill.—Paving is contemplated for several streets.

Wheeling, W. Va.—Paving is contemplated for 25 miles of streets.

Council Bluffs, Ia.—Brick paving is contemplated for W. Broadway st.

Dubuque, Ia.—Brick paving is proposed for Eagle Point and Windsor ave.

Green Island, N. Y.—Paving is contemplated for Hudson ave. and Hamilton st.

Litchfield, Ill.—Paving is contemplated for about 3 miles of business streets.

Clarksville, Ga.—Voted to issue bonds for macadamizing 1½ miles of the main street.

Sarnia, Ont.—Creosoted wood block and brick paving is contemplated for Front st.

Healdsburg, Cal.—Cement sidewalks in the residence portion of this city are contemplated.

Pleasantville, N. J.—Will vote on the issue of $10,000 bonds for sidewalk improvements.

Averyville, Ill.—The village board decided Feb. 13 to construct cement sidewalks on Hanng's ave.

Reading, Pa.—New specifications for street paving were discussed by the bd. of pub. wks. Feb. 18.

Superior, Wis.—City Engineer Banks advocates the discontinuance of wooden walks and the substitution of cement.

Fort Wayne, Ind.—Asphalt paving is contemplated for Gay, Union, Barthold and Dock sts. H. W. Beckes, clk B. P. W.

Norfolk, Va.—This city contemplates paving Monticello ave. and widening and paving Chapel st. W. T. Brooke, cy. engr.

Grand Rapids, Mich.—Resolutions have been passed for paving LaGrave st. with brick or concrete and graveling Grances ave.

Mendota, Ill.—An ordinance was passed Feb. 14 to pave Main, Washington and Jefferson sts., Illinois ave. and an alley with brick.

Akron, O.—The property owners in Cherry st. have petitioned for paving. Ordinances have been approved for paving Quarry, Church and Center sts.

Massillon, O.—City Engineer Howald has submitted estimates of the cost of proposed paving on S. East, Bank, Summit and Railroad sts. and 2 alleys.

Seattle, Wash.—Plans and specifications have been submitted to the board of public works for sandstone block and asphalt paving, concrete sidewalks, etc., on certain streets.

Hobart, Okla.—Special.—O. E. Noble, cy. engr., says the question of issuing $25,000 bonds for street improvements will be voted on. The city will also construct 14 blocks of paving.

Newark, N. J.—Vitrified brick paving is contemplated for Mulberry and Fabyan Places, Governor, Vince, Magnolia and Columbia sts., and Meeker and Badges aves., and granite block paving for Spring st. M. R. Sherrerd, chief engr. Specifications will be prepared for telford, bitulithic and brick paving on a large number of streets.

Buffalo, N. Y.—Special.—The common council has decided that assessments be made for paving Goethe st. with the German Rock & Cement Co.'s standard asphalt on concrete base; cost, $9,318; paving Imson st. same as above; cost, $7,968; repaving Seneca st., Bliss, Babcock and Peabody sts. with medina sandstone block on concrete base at $554,500.

CONTRACTS TO BE LET.

Nashville, Ill.—Bids are asked until March 7 for paving. P. Ziegel, mayor.

Lima, O.—Bids are asked until March 5 for 34,000 sq. yds. of brick paving. L. M. Crimmine, clk. B. P. S.

Kalamazoo, Mich.—Bids are asked until

March 4 for about 30,000 sq. yds. of paving. Horace E. Ralston, cy. clk.

Duluth, Minn.—Bids are asked until March 10 for paving Jefferson st. with tar, macadam or asphalt. Cy. engr.

Youngstown, O.—Bids are asked until March 2 (ready) for paving Center and Baldwin sts. and W. Lincoln ave. B. P. S.

Parkersburg, W. Va.—Bids are asked until March 20 for 5,700 sq. yds. of brick or asphalt paving. J. V. Dunbar, cy. engr.

Vincennes, Ind.—Bids are asked until March 5 for constructing more than 2½ miles of gravel road in Vincennes twp. Co. com.

Cleveland, O.—Bids are asked until March 2 for grading and paving Kinsman road in Warrensville and Orange twps. A. B. Lea, co. engr.

Princeton, Ind.—Bids are asked until March 8 (readvt.) for constructing 11 miles of gravel roads in Center twp. John P. Moore, chm. co. com.

Valparaiso, Ind.—Bids are asked until March 8 for constructing cement curbing and gutters on Morgan, Michigan and Water sts. Robt. Ewing, cy. clk.

Mishawaka, Ind.—Bids are asked until March 4 for constructing 37,000 sq. yds. of brick and 12,000 sq. yds. of asphalt paving. Wm. S. Moore, cy. engr.

Sullivan, Ind.—Bids are asked until March 5 for constructing stone roads in Jefferson, Jackson, Hamilton, Cass and Gill twps. Co. Audt. Russell.

Milford Center, O.—Sealed bids are asked until March 8 for paving State and Mill sts. with vitrified brick. Vil. coun., J. C. Kennedy, engr., Marysville, O.

Goshen, Ind.—Bids are asked until 7:30 p. m. March 4 for constructing 6 blocks of brick paving with combination curb and gutter. C. C. Witt, cy. engr.

Salem, Ore.—Bids are asked until Mar. 15 for constructing approaches and improving grounds at U. S. Postoffice. Jas. Knox Taylor, Supv. Arch., Washington, D. C.

Columbus, O.—Bids are asked until March 5 for constructing State highways at Wooster; March 6 at Akron, O.; March 7 at Newark, O. Sam Houston, Com. State Highway Dept.

Cleveland, O.—Sealed bids are asked until March 2 for paving Kinsman road in Warrensville and Orange twps., and until March 9 for paving Brecksville road. Julius C. Dorn, clk. co. com.

Annapolis, Md.—Sealed bids are asked until March 4 for 11,000 sq. yds. of macadam paving; 6,500 cu. yds. excavation; 400 lin. ft. new granite curb; 2,000 lin. ft. new cement curb; 4,600 lin. ft. old curb reset. Phil. E. Porter, cy. clk.

Two Rivers, Wis.—Bids are asked until March 7 for gravel, macadam and curb work on Williams st., requiring 1,364 cu. yds. excavation; 2,473 cu. yds. filling; 1,070 sq. yds. gravel; 431 sq. yds. crushed stone; 511 posts for curbs; 213 lbs. 6-in. spikes. B. P. W.

Port Clinton, O.—Sealed bids are asked until March 4 for paving Adams st. with vitrified blocks, brick, asphalt blocks or sheet asphalt, on foundation of stone screenings and sand, with grading, curbing, retaining walls, drainage, etc. J. J. Huber, vil. clk.

Salt Lake City, Utah.—Bids are asked until March 14 for constructing 1,118,000 sq. ft. cement sidewalks; 70,000 sq. yds. macadam paving; repairing asphalt pavements; cement curb and gutter; 15,000 sq. yds. asphalt paving. F. J. Leonard, chm. B. P. W.; L. O. Kelsey, cy. engr.

Canton, O.—Bids are asked until March 6 for flagging and curbing 12 streets. B. F. Faust, clk B. P. S.

Kalamazoo, Mich.—Bids are asked until March 4 for constructing 30,000 sq. yds. of street paving. Horace F. Ralston, cy. clk.

Brazil, Ind.—Bids are asked until Mar. 7 for constructing 7,915 ft. of gravel road in Van Buren twp. Jas. L. Burns, co. audt.

Lima, O.—Sealed bids are asked until March 5 for constructing 17,000 sq. yds. of vitrified brick paving on Pine st. L. L. Crumrine, sec. B. P. S.

Decatur, Ind.—Bids are asked until March 4 for constructing gravel and macadam roads in Preble, Hartford and Root twps. C. D. Lewton, co. audt.

Port Clinton, O.—Bids are asked until March 4 for paving Adams st. with vitrified blocks, brick, asphalt blocks or asphalt. J. J. Huber, vil. clk.

New York, N. Y.—Bids are asked until March 6 for paving and constructing cross walks in various streets in Brooklyn. Bird S. Coler, boro pres.

Sheridan, Ind.—Sealed bids are asked until March 4 for paving Georgia st. from 1st to 7th with brick on gravel foundation. J. W. Lindley, town clk.

Winchester, Ind.—Bids are asked until March 7 for crushed stone paving in Wayne, Washington, West River, White River and Ward twps. Mack Pogue, co. audt.

Milwaukee, Wis.—Sealed bids are asked until March 5 for paving Wells st. from 28th to 31st with creosoted wood blocks. Chas. J. Poetsch, chm. B. P. W.

Princeton, Ind.—Sealed bids are asked until March 8 for constructing 5 miles of macadamized roads. John P. Moore, chm. co. com.; Harry R. Embree, co. audt.

New York, N. Y.—Bids are asked until March 7 for furnishing and delivering North River road gravel for drives and bridle paths in Central and Riverside parks. Moses Herrman, pres. park bd.

Annapolis, Md.—Sealed bids are asked until March 4 for 11,000 sq. yds. of macadam paving; 6,500 cu. yds. excavation; 400 lin. ft. new granite curb; 2,000 lin. ft. new cement curb; 4,600 lin. ft. old curb reset. Phil E. Porter.

Adrian, Mich.—Bids are asked until March 11 for 24,250 sq. yds. of asphalt paving on concrete; 9,665 cu. yds. excavation; 13,559 ft. combined concrete curb and gutter; 17 catch basins; 50 inlets, etc. John Mawdsley, co. clk.

CONTRACTS AWARDED.

Jacksonville, Fla.—The contract for constructing sidewalks on Riverside ave. and Stockton st. was awarded to the Southern Fuel Supply Co., at $1.25 a sq. yd. for cement concrete and $1 a sq. yd. for tile walks.

Freeport, Ill.—M. Ford of Cedar Rapids, Ia., was awarded the contract for paving various streets.

Buffalo, N. Y.—The contract for paving Park View ave. with brick was awarded to F. V. E. Bardol for $8,400.

Petersburg, Ind.—J. N. Kinnon was awarded the contract for constructing 23,168 ft. of rock roads for $16,248.

New Orleans, La.—The contract for paving various streets was awarded to the Hassam Paving Co., of Worcester, Mass.

Bessemer, Ala.—The contract for constructing 12,000 sq. yds. of cement sidewalks was awarded to J. N. Bigler for $11,640.

Tacoma, Wash.—Maxham & Wells were awarded the contract for paving Puyallup ave. with brick on concrete base for $20,810.

Jacksonville, Fla.—The contract for improving various streets was awarded to

the H. Walter Fuller Co., of St. Petersburg, Va.

Des Moines, Ia.—J. C. Likes was awarded the contract for paving 16th st. from Woodland to Pleasant sts. at $1.63 a sq. yd.

Terre Haute, Ind.—The contract for paving N. 6th st. with vitrified brick was awarded Feb. 6 to Roberts & Co. for $21,280.

Kansas City, Mo.—The Parker Washington Co. was awarded the contract for macadamizing 15,250 sq. yds. of Swope Parkway at 74 cents a sq. yd.

Bloomfield, Ind.—The contract for constructing a macadam road in Wright twp. was awarded Feb. 5 to Lewis Letsinger of Jasonville for $4,674.

Albany, N. Y.—Contracts have been awarded as follows: Improving Tennis st., Mulderry Bros., Albany, $5,829; paving S. Lansing st., T. Henry Dumary, Albany, $10,400.

Norfolk, Va.—The contract for paving the Jamestown Exposition Boulevard with bitulithic was awarded to the Atlantic Bitulithic Co. of Spartanburg, S. C., at $2.25 a sq. yd.

Rochester, N. Y.—Whitmore, Rauber & Vicinus submitted the lowest bid Feb. 13 for paving Monroe ave. with asphalt, with Johnsonburg brick in car tracks, for $68,056, or Jamestown brick in car tracks for $66,156.

Boston, Mass.—Contracts for constructing State highways were awarded Feb. 5 as follows: In Palmer, W. N. Flynt Granite Co., $6,405; in Templeton, Antonio Depplete, $5,481; in Dudley, R. F. Hudson, $4,936.

Valparaiso, Ind.—Contracts for constructing 45 miles of gravel roads were awarded Feb. 5 as follows: John McGovern of Chicago, 20 miles; Demasco Bros. of Chesterton, 10 miles; Conover & Lebour of Winamac, 15 miles; total cost, $110,000.

Spokane, Wash.—Paving contracts have been awarded as follows: J. Costello, grading 21st ave., for $5,604; Mitchell Bros., grading Effie ave., $3,195; John Fife, sidewalk on Effie ave., $3,100; J. H. McAllister, sidewalk on 19th ave., $1,799.

New Orleans, La.—The Barber Asphalt Paving Co. has been awarded contracts for paving Carondelet st. with asphalt for $4,068, and Carroll st. for $27,140. The South Bitulithic Co., of Nashville, Tenn., was awarded the contract for 70,210 sq. yds. of bitulithic paving at $2.70 a sq. yd., or $199,000.

Syracuse, N. Y.—The Warner Quinlan Asphalt Co. was awarded a contract Feb. 12 for repairing asphalt pavements upon which guarantees have expired during the year at $1.33 a sq. yd. Bids were received from the Warner Quinlan Co. and the Central City Paving Co. for paving W. Onondaga st. from Putnam to Geddes. The two companies submitted 16 proposals, ranging from $19,560 to $23,274.75.

Oklahoma City, Okla.—The Barber Asphalt Paving Co. was awarded contracts for paving E. 8th and E. 5th sts. with asphalt on 6-in. Portland cement concrete base as follows: $2.15 per sq. yd. for paving; 80 cts. per lin. ft. for curb; 20 cts. per lin. ft. to reset curb; vitrified pipe, 60 and 87 cts. per lin. ft.; catch basins, each $35; manholes, each $46; excavating, 30 cts. per cu. yd.; total, $50,112. W. C. Burke is city engr.

East St. Louis, Ill.—The contract for improving 13th st. from St. Clair ave. to Nectar ave. was awarded to M. J. Kelly as follows: Paving with Albion brick, 18,270 sq. yds., $1.50; 4,980 ft. 6-in. pipe laid, 23 cts.; 600 ft. 10-in., 40 cts.; 820 ft. 12-in., 60 cts.; 1,600 ft. 15-in., 70 cts.; 2,600 ft. 18-in., 80 cts., and 2,480 ft. 20-in., $1.10; 15 cast-iron manhole covers, each $12; 18 stone inlets, $12; 99⅞ cu. yds. brick masonry, $9; 7,530 ft. limestone curb, set, 60 cts.; 7,640 cu. yds. excavation, placed in fill, 25 cts., and 1,220 cu. yds. fill in excess of excavation, 20 cts.; total cost, $43,176.

Brooklyn, N. Y.—The contract for regulating, grading and constructing sidewalks on Gravesend ave. was awarded to Bracken, McAveney & Co. as follows: 18,400 lin. ft. new curb, set in concrete, 90 cts.; 10,400 cu. yds. earth excav., 35 cts.; 15,040 cu. yds. earth fill, 20 cts.; 81,850 sq. ft. cement sidewalk, 14 cts.; total, $34,721. The total of the other bids were: M. F. Hickey, 413 10th st., $39,940; Norton & Gorman, 303 Douglas st., $38,000; Seaboard Constr. Co., 639 Gates ave., $38,408; John E. Quinn, 227 Linden ave., $43,709; Danl. Douglas, 122 Logan st., $38,303; N. Schneider's Sons Co., 144 21st st., $40,454; Thos. P. Murphy, 25th ave. and Cropsey ave., $47,863; Chas. Cranford, 44 Court st., $41,513; Josiah T. Kutan, 4 Court Sq., $40,500; J. J. Guinan, Gravesend ave. and Neck road, $43,839, and Mangieri Co., 2243 1st ave., N. Y. City, $37,045.

Akron, O.—The contract for paving Howard st. from Cuyahoga Falls to Frederick st. was awarded to McAllonan Bros.

Harrisburg, Pa.—The Barber Asphalt Paving Co., Land Title Bldg., Philadelphia, was awarded a contract for 49,605 sq. yds. of asphalt paving, and the Warner-Quinlan Asphalt Co., 438 S. Salina st., Syracuse, secured the contract for 75,000 sq. yds. of asphalt paving.

Bessemer, Ala.—John Bigler was awarded contracts for improving sidewalks as follows: 12,000 sq. yds. cement sidewalk at 97 cts.; 800 sq. yds. cement alley crossings at $1.30; 400 sq. yds. brick street crossings at $1.70; 100 lin. ft. 4-in. clay pipe drains at 10 cts.

Elkhart, Ind.—Bids for paving Harrison st. with brick were submitted Feb. 18 by John Moran at the Northern Construction Co., city; W. W. Hatch & Son of Goshen; Bercaw & Fulwider of Lebanon, Ind.; Moellering Construction Co., of Ft. Wayne; W. North Beau of St. Joseph, Mich., and Raukert & Eggleston, of Mishawaka. Action on the bids was deferred.

Rochester, N. Y.—Contracts for paving were awarded Feb. 13 as follows: Brick paving of Caroline st., Caulder block, W. F. & G. W. Lauer, $4,033.75; brick paving of Boston street, Clearfield block, H. B. Hooker & Son, $5,134.50; street monuments, Joseph D. Argento, $1.55 each; brick paving of Ulm st., F. A. Brotsch, $12,766.

SEWERS.

Cienfuegos, Cuba.—City council has voted to reconsider the contract and the loan of $3,000,000 for the construction of an aqueduct and sewer on the ground of irregularity.

CONTEMPLATED WORK.

Hankinson, N. D.—A drainage system is proposed.

Mangum, Okla.—Voted to issue bonds to construct a sewerage sytsem.

Shelbyville, Ky.—Plans are being prepared for building new sewers.

Willmar, Minn.—Council voted to construct a sewer in the First ward.

Winfield, Kan.—A sewerage system is contemplated. J. O. Yeager, cy. clk.

Hammond, La.—A new sewerage system is contemplated. Jas. B. Adams, town clk.

New Bedford, Mass.—This city will construct sewers. Wm. F. Williams, cy. engr.

Pottstown, Pa.—A sewerage system is contemplated. F. B. Trout, chm. sewer com.

Princeton, Ind.—Council is discussing the question of constructing a sewerage system.

Batavia, N. Y.—Will vote on the question of constructing a sewerage system. J. H. Wood, cy. clk.

Lawrence, Mass.—A trunk sewer is contemplated on east side of Prospect Hill. A. D. Marble, cy. engr.

Bloomington, Ill.—A new 12-inch pipe sewer in Moulton st. is contemplated. Elmer Folsom, cy. engr.

Oshkosh, Wis.—New relief sewers in various streets are contemplated. Geo. H. Randall, cy. engr.

Ypsilanti, Mich.—A petition has been presented to council asking for a sanitary sewer in Summit st.

Knoxville, Tenn.—Bids will be asked soon for constructing sewers during 1907. W. C. Crozier, cy. engr.

Joplin, Mo.—The question of issuing bonds for constructing a storm sewer system is being considered.

Council Bluffs, Ia.—The construction of about 1 mile of small sewer is contemplated. S. L. Etnyre, cy. engr.

Dundee, Ill.—Plans for the sewer system have been submitted and the question will be voted on April 16.

Warren, Pa.—Plans for constructing 18,000 ft. of pipe sewers are being prepared by E. M. Milligan, cy. engr.

Chester, Pa.—Ordinances have been passed for constructing sewers on 8th and 20th sts. S. R. Crothers, mayor.

Scio, Mich.—Plans for a sewerage system and sewage disposal plant are being prepared by Riggs & Sherman, of Toledo.

Aberdeen, Wash.—Bids are asked until about March 1 for constructing 6 miles of sewers. H. W. Troutman, cy. engr.

Brookings, S. D.—Plans and specifications have been completed for constructing a sewerage system. G. H. Stoddard, cy. audt.

Durant, I. T.—Will vote March 11 on the issue of $35,000 bonds to construct a sewerage system and extend water mains.

Waterloo, Ia.—C. T. Wilson, cy. engr., has been directed to prepare plans for constructing a new sewer system in East Waterloo.

Muncie, Ind.—John O. Potter, cy. engr., has been directed to prepare plans for building sanitary sewers in various streets.

Buffalo, N. Y.—City council has authorized the construction of a 10-in. sewer in Molrican ave. Francis G. Ward, com. pub. wks.

Kokomo, Ind.—Plans and specifications for 3,100 ft. of vitrified brick sewer in Louisa st. have been completed by Cy. Engr. Mann.

Providence, R. I.—A resolution has been introduced providing an appropriation of $600,000 for sewer construction. Mayor McCarthy.

Boonton, N. J.—A brick archway intercepting will be built from Dover to this place to protect the Jersey City reservoir.

Sacramento, Cal.—Specifications for a new reinforced concrete sewer and pumping plant have been completed by Geo. Randle, cy. engr.

Waterbury, Vt.—Voted to install a sewerage system and bids will be asked soon. Geo. W. Morse, L. J. Roberts, O. L. Ayers, bd. trustees.

Blooming Prairie, Minn.—The question of constructing a sewerage system with septic tank is under consideration.

Freeport, Ill.—This city contemplates the construction of about 5 miles of pipe sewers this summer in Sewer Dist. No. 12. G. W. Graham, cy. engr.

Warren, O.—Plans are being prepared and bids will be asked for about 3 miles of pipe sewers, including a trunk sewer. E. M. Milligan, cy. engr.

Springfield, O.—W. H. Sieverling, cy. engr., submitted estimates of the cost of the proposed outfall sewer Feb. 11. Approximate cost, $38,846.91.

Medina, N. Y.—Legislature has passed bills authorizing the city to issue bonds, and contracts will be let soon for constructing a sewerage system.

Brooklyn, N. Y.—The board of estimate has appropriated $2,000,000 in corporate stock for constructing relief sewers. The plans have been prepared.

Little Rock, Ark.—Plans and specifications and surveys for a complete sewerage system for this city will be made by Burns & McDonnell, of Kansas City.

Perth Amboy, N. J.—An ordinance has been approved for building a 24-in. pipe sewer in Broad and Front sts. A Bollschweiler, mayor; Chas. MacWilliams, cy. engr.

Joliet, Ill.—The construction of a drainage district with concrete trunk sewer to drain sewers in 1st, 7th and 5th wards is contemplated. Hubert A. Stevens, cy. engr.

Morristown, N. J.—The sewer commissioners have purchased a large tract of land east of this city preliminary to establishing a sewerage system. Eugene S. Burke, mem. com.

Watertown, S. D.—Special.—J. C. Carpenter, asst. cy. engr., says city council is asking for bids for 2,686 ft. of 3-ft. sewers to replace the present 18-in. outlet. Bids are desired on brick, reinforced concrete, vitrified or cement sewer pipe.

Jenkintown, Pa.—Abington & Cheltenham have vetoed the proposition to join this city in the installation of a sewerage system. Burgess William L. Clayton, however, has asked the board of health to continue the investigation. The estimated cost of the Jenkintown district is $100,000.

Bloomington, Ill.—Plans for a sewerage system, providing for about 30 miles of sewer mains, have been submitted by Engineer Alvord of Chicago. The system will cost approximately $260,000, but only about 11 miles would be built now, at a cost of $106,000. The septic tank with mains from the corporation limits to the location of the plant will cost $20,000.

Excelsior, Minn.—A sewerage system is contemplated.

Dayton, O.—A sanitary sewer in North Dayton is contemplated.

Struthers, O.—Plans are being prepared for a sewerage system.

Browns Valley, Minn.—Plans for a sewerage system are being prepared.

Fenton, Mich.—A sewerage system is contemplated. O. Robinson, vil. clk.

Medina, N. Y.—Plans have been prepared for extending the proposed sewerage system and have been accepted. F. A. Roberts, vil. clk.

Gloversville, N. Y.—The construction of an experimental testing station in the spring is contemplated. Morrell Vrooman, cy. engr.

Independence, Mo.—Special.—R. T. Proctor, cy. engr., advises us that bids will probably be asked the latter part of March for filter tanks for the sewerage system.

Trenton, Tenn.—Dr. T. J. Happel, G. W. Wade and T. E. Harwood have been appointed to petition Legislature for the privilege of voting $60,000 bonds for sew-

erage, electric light plant, graveling streets, etc.

Springfield, O.—City council has authorized issue of $50,000 to $175,000 bonds for the main sewer of the new sanitary system. The lengths and sizes required this season are: 8,010 ft. 18-in.; 3,804 ft. 24-in.; 1,900 ft. 28-in., 2,100 ft. 32-in., and 4,465 ft. 36-in. W. H. Sieverling, ch. engr. B. P. S.

CONTRACTS TO BE LET.

Sheridan, Wyo.—Bids are asked until March 4 for sewer extensions. E. W. Long, cy. clk.

Toledo, O.—Bids are asked until April 1 for constructing a sewer system. F. J. Consand, cy. engr.

Scranton, Pa.—Sealed bids are asked until March 9 for constructing certain sewers. C. R. Acker, dir. pub. wks.

Parkersburg, W. Va.—Bids are asked until March 1 for constructing 1,500 ft. of brick sewers. J. V. Dunbar, cy. engr.

Willoughby, O.—Sealed bids are asked until March 4 for constructing the Center st storm sewer. C. C. Jenkins, vil. clk.

Clarion, Ia.—Bids are asked until Mar. 4 for constructing drains or ditches near Eagle Grove. E. M. Calender, co. audt.

Columbus, O.—Bids are asked until March 5 for 96 ft. of c. i. culvert pipe delivered at Melrose. Chas. E. Perkins, ch. engr.

Washington, D. C.—Sealed bids are asked until March 4 for constructing trunk sewers. H. B. F. Macfarland, chm. dist. com.

Aberdeen, S. D.—Bids are asked until March 11 for constructing a 6,000,000-gal. septic tank of reinforced concrete. F. W. Raymond, cy. audt.

Wheaton, Minn.—Sealed bids are asked until March 8 for constructing sewers in Fargo, Broadway and Front sts. G. K. Kristenson, vil. recdr.

Fairbury, Neb.—Sealed bids are asked until March 5 for constructing 4,358 ft. 8-in. sanitary sewer in Dist. Nos. 4, 5 and 8. W. W. Watson, cy. engr.

Burlington, Ia.—Sealed bids are asked until March 18 for constructing a vitrified pipe sewer in Locust st. with branches. J. F. Winters, cy. engr.

Sayre, Pa.—Bids are asked until Mar. 12 for constructing 4,400 lin. ft. 24-in., 1,060 ft. 20-in., and 560 ft. 18-in. pipe trunk line sewer. H. H. Mersereau, boro clk.

Pittsburg, Kan.—Sealed bids are asked until March 20 for constructing 8,817 ft. 21-in., 9,193 ft. 15-in., 12,933 ft. 12-in., and 977 ft. 10-in. vitrified pipe sewer and 71 manholes. N. E. Wood, cy. clk.

Crowley, La.—Bids are asked until April 2 for constructing a system of sewers, consisting of 38,660 ft. 8-in., 840 ft. 10-in., 1,180 ft. 12-in., 5,750 ft. 14-in., 8,440 ft. 12-inch., 1,560 ft. 16-in. and 1,030 ft. 18-in. sewer pipe; 24 flush tanks; 64 manholes; pumping station with electricity driven pumps. Shelby Taylor, mayor.

Ottumwa, Ia.—Bids are asked until March 11 for constructing trunk sewers as follows: 475 ft. 9-ft., 2,783 ft. 8-ft., and 430 ft. 7-ft. reinforced concrete; 940 ft. 8-ft. brick and stone sewer; 1,930 ft. 5-ft. brick or vitrified block sewer; 480 ft. 3-ft. vitrified clay pipe sewer. C. R. Allen, cy. engr.

Ann Arbor, Mich.—Bids are asked until March 6 for building sanitary sewers.

St. Bernard, O.—Bids are asked until March 14 for constructing a sewer in Sullivan ave. Geo. Schroeder, vil. clk.

Lima, O.—Bids are asked until March 10 for constructing a sewer in S. Baxter st. L. E. Crumrine, secy. B. P. S.

McKeesport, Pa.—Bids are asked until April 1 for constructing two 6-ft. brick sewers, each 3 miles long. T. W. White, cy. engr.

Rolla, Mo.—Bids are asked until 7 p. m. March 4 for constructing a sewer and waterworks system requiring 20,000 ft. of sewer pipe and 10 flush tanks. Mayor.

White Plains, N. Y.—Sealed bids are asked until March 20 for constructing 12 miles of reinforced circular concrete sewer, 3 to 6 ft. in diameter, and about 3 miles of circular concrete lined tunnel 6½ to 8½ ft. in diameter. Frank N. Glover, sec., Bronx Valley Sewer Com.

Horton, Kan.—Bids will be received in March for building sewers. P. B. Norris, cy. clk.

Nevada, Mo.—Sealed bids are asked until March 5 for constructing district sewer No. 11. S. L. Higgins, cy. clk.

Lima, O.—Sealed bids are asked until March 9 for constructing a sewer on Baxter st. L. L. Crumrine, sec. B. P. S.

National Home, Wis.—Bids are asked until March 12 for laying sewer pipe, cement gutters and sidewalks. J. E. Armitage, treas. N. H. D. V. S.

Pittsburg, Kan.—Sealed bids are asked until March 20 for constructing 8,817 ft. 21-in., 9,193 ft. 15-in., 933 ft. 12-in., and 977 ft. 10-in. vitrified pipe sewer with 71 manholes. A. B. Kirkwood, mayor.

Des Moines, Ia.—Bids are asked until March 11 for 594 ft. 12-in. sewer on E. 5th st.; also until 11 a. m. March 12, for Grand View sewer system No. 2, about 268 ft. 8-in., 2,821 ft. 10-in., 2,859 ft. 12-in., 2,494 ft. 15-in., 1,359 ft. 18-in., 661 ft. 20-in., and 2,692 ft. 24-in. Bids will also be received March 5 for Grand View sewer No. 1, aggregating 10,449 ft. 10-in. to 20-in. W. W. Wise, chm. B. P. W.

CONTRACTS AWARDED.

Webb City, Mo.—The contract for building a sewer in Dist. No. 16 was awarded to C. M. Gray of Carterville, Mo.

St. Paul, Minn.—W. J. Preston was awarded a contract Feb. 5 for constructing the Weide ave. sewer system for $23,850.

Susanville, Cal.—The contract for constructing a sewerage system was awarded to Archy Buchler of this city for $9,545.

Cedar Falls, Ia.—The contract for constructing 3,768 ft. of storm sewer was awarded to N. A. Camery of Harlan, Ia., for $16,005.

Portsmouth, O.—The contract for constructing the new Drew factory sanitary sewer was awarded to S. Monroe & Son for $7,966.20.

St. Mary's, O.—The contract for building a new sewerage system has been awarded to F. S. Mitchell of Bellefontaine for $85,000.

Marianna, Ark.—The contract for completing the sewer system was awarded to Hamilton Bros., of Weatherford, Tex., for $5,650.

Syracuse, N. Y.—Samuel Bown, 654 Burnet ave., was awarded the contract for constructing a pipe sewer system in the 17th ward, for $3,494.

Norristown, Pa.—The contract for constructing 2,914 ft. of 8-in. sewers in DeKalb and Beach sts. was awarded to Berglaus & Moffet of Harrisburg.

Kansas City, Mo.—The Parker-Washington Co. secured contracts for constructing sewers as follows: Dist. No. 4, $27,318.45; Dist. No. 251, $1,343.

Cape Girardeau, Mo.—Walter Cowan of East St. Louis, Ill., was awarded the contract for constructing a complete sewer system in Dist. No. 1 for $58,967.71.

Chicago, Ill.—The contract for completing section 3 of the Southwest Land Tun-

nel was awarded Feb. 8 to the Jackson & Corbett Construction Co. for $1,550,000.

Charleston, W. Va.—Bids were submitted Feb. 16 for constructing sewers as follows: T. H. Bowman, without time, $188,183; with time, $195,683; C. T. McCrackin & Co., $174,032 and $180,282; Pfaff & Smith, $185,947 and $193,447.

Crookston, Minn.—Contracts for constructing sewers have been awarded as follows: 30-in. pipe sewer in Houston ave., J. E. O'Brien & Co., $4 a lin. ft.; pipe sewers in Alexander, Walsh and River sts and Summit and Linden aves., Jas. Kennedy of Fargo, N. C., $6,904.

Lansing, Mich.—J. H. Allgate was awarded a contract for building sewers in various streets for $9,072. The contract for constructing a section of Weinman Creek sewer was awarded to Jas. A. Black for $65,000. This sewer will be 1,920 ft. long, of which 1,310 ft. will be 40 by 60 inches brick sewer and 610 ft. of concrete.

New Brighton, L. I., N. Y.—The contract for constructing a system of reinforced concrete sewers and appurtenances was awarded to Jos. Johnson's Sons of West New Brighton as follows: Reinforced concrete sewer: 22 lin. ft., including apron, $40; 272 lin. ft. flat top, $18.50; 705 lin. ft. 6 ft. 4 in., $25; 102 lin. ft. Class A, of 4 ft. 6 in. x 6 ft., $20; 36 lin. ft. Class B, 4 ft. 6 in. x 6 ft. 9 in., $20; 210 lin. ft. Class A, 4 ft. 4 in. x 6 ft. 6 in., $17; 25 lin. ft. Class B, 4 ft. 4 in. x 6 ft. 6 in., $14.50; 1,187 lin. ft. Class A, 3 ft. 10 in. x 5 ft. 9 in., $18.25; 300 lin. ft. Class B, 3 ft. 10 in. x 5 ft. 9 in., $12.75; 200 lin. ft. Class C, 3 ft. 10 in. x 5 ft. 9 in., $12.75; 60 lin. ft. Class A, 3 ft. 8 in. x 5 ft. 6 in., $15; 50 lin. ft. Class B, 3 ft. 8 in. x 5 ft. 6 in., $15; 100 lin. ft. Class A, 3 ft. 6 in. x 5 ft. 3 in., $12; 25 lin. ft. Class B, 3 ft. 6 in. x 5 ft. 3 in., $13.50; 50 lin. ft. Class A, 3 ft. 2 in. x 4 ft. 9 in., $11; 98 lin. ft. Class B, 2 ft. 2 in. x 4 ft. 9 in., $11; 100 lin. ft. Class C, 3 ft. 2 in. x 4 ft. 9 in., $11; 100 lin. ft. Class B, 3 ft. x 4 ft. 6 in., interior diam., $8.50; 147 lin. ft. Class C, 3 ft. x 4 ft. 6 in., $9.50; 102 lin. ft. Class B, 2 ft. 4 in. x 3 ft. 6 in., $8; 100 lin. ft. Class C, 2 ft. 4 in. x 3 ft. 6 in., $7; 128 lin. ft. Class B, 2 ft. 2 in. x 3 ft. 3 in., $6.85; 87 lin. ft. Class C, 2 ft. 2 in. x 3 ft. 3 in., $7.25; 33 lin. ft. Class B, 1 ft. 8 in. x 2 ft. 6 in., $6; 457 lin. ft. Class C, 1 ft. 8 in. x 2 ft. 6 in., $6. Salt-glazed vitrified stoneware pipe sewer: 682 lin. ft. 12 in. interior, $2; 29 reinforced concrete receiving basins of the circular pattern, with 1¼-in. galvanized wrought iron bars and iron traps, $90; 2 special manholes, $90; 27 manholes, $60; 1 drop manhole, $300; 3 other manholes, $150; 5,800 lin. ft. piles, 35 cts.; 25.4 M. ft. yellow pine foundation timber and plank, $50; 36 M. ft. spruce planking, $50; 10 cu. yds. concrete, $8; 10 cu. yds. rip-rap in place, $1; 40 cu. yds. additional excavation, 75 cts.; 50 cu. yds. additional filling, 50 cts.; 228 lin. ft. cast iron pipe, 20 in. diam., $15; 2 M. ft. sheeting, $40; 200 sq. ft. additional reinforcing metal, 5 cts.; 300 lbs. additional reinforcing metal (steel bars) 5 cts.; 570 lin. ft. 5-in. x 16-in. bluestone curb, $1.10; 25 lin. ft. 15-in. vitr. pipe, $2.50; 40 lin. 12-in. vitr. pipe, $2; total cost, $89,016.

Buffalo, N. Y.—Special.—Bids for constructing sewers were submitted Feb. 15 as follows: (1) Elmwood ave., bet. Hertel ave. and Kenmore ave., brick, 4¼ to 2½ ft., 3,200 ft.; (2) Mohican st., bet. Fillmore and N. Y. C. R. R., tile, 12-in., 50 ft.; (3) Regent st., bet. Bailey ave. and 460 ft. east, tile, 15-in., 460 ft. Wm. Franklin, 699 7th st., (1), $25,800; (2), $977; (3), $820. Miller & Franklin, 903 D. S. Morgan Bldg., (1), $26,000; (2), $1,240; (3), $1,150; Geo. W. Moore, 177 Elk st., (1), $27,000; (2), $1,400; (3), $785. Louis W. Gipp, 531 Ellicott Square, (1), $27,900. Joseph Stabell & Co., 1127 Niagara st., (1), $28,000. Fred J. Mumm, 176 Best st., (1), $29,900; (2), $1,332; (3), $862. Lawrence Savage, 381 Ellicott Square, (1), $47,000. Bids all referred to sewer committee.

WATER WORKS.

Chicago, Ill.—The proposition to purchase the Rogers Park water plant was again taken up Feb. 13 by a sub-committee of the finance committee and the value of the plant fixed at $365,000, which is $65,000 in excess of the offer made by the company in 1904.

CONTEMPLATED WORK.

Bloomington, Ill.—New bids will be asked for laying a water main.

Cincinnati, O.—The purchase of water meters is contemplated. Mayor Dempsey.

Fremont, Neb.—Plans for the new municipal waterworks system have been prepared.

Trenton, N. J.—The question of installing water meters is being urged by the press.

Atlanta, Ga.—The question of issuing bonds for waterworks improvements will be voted on March 5.

Detroit, Mich.—The question of reconstructing the present waterworks system is being considered.

Jamestown, N. D.—The north side residents are petitioning for the extension of the waterworks system.

Niagara Falls, N. Y.—Water mains will be laid in Haeberle and Grand aves. and 13th and Sugar sts.

Mt. Auburn, Ill.—A waterworks system is contemplated.

Zumbro Falls, Minn.—The question of constructing a waterworks system is being agitated.

Bradford, Pa.—Bids will be received in March or April for a reservoir. Board Water Com.

Seattle, Wash.—Will vote March 23 on the question of constructing a municipal water system at South Park.

Chatsworth, Ill.—The water tower, pumps and engines of the waterworks system were destroyed by fire Feb. 14.

Ault, Colo.—New bids will probably be received about March 15 for constructing waterworks. C. H. Bradfield, town clk.

Pittsburg, Pa.—Councils are considering the matter of submitting the issue of bonds for laying new water mains to vote.

Rome, N. Y.—The bd. of water and sewer commisrs. contemplates constructing the Fish Creek water system. John L. Plumkill, cy. engr.

The question of issuing waterworks bonds has been favorably voted on at the following places: Bruce, Wis., Stroud, Okla., East Troy, Wis.

West Orange, N. J.—The question of selling the water plant of the West Orange Water Co. to this city or make a new contract will be voted on March 6.

Detroit, Mich.—The w. w. bd. has authorized the construction of 1½ miles of 42-in. main between Vinewood and Livernois aves. Robert H. McCormick, cy. engr.

Chattanooga, Tenn.—Legislature has passed the bill authorizing the city to vote on the issue of $900,000 bonds for buying or building a waterworks system.

Portland, Ore.—Will vote in June on the issue of $250,000 for constructing reinforced water mains, and $2,500,000 for a second pipe line from Bull Run.

Bradford, Pa.—Plans for constructing a reservoir on the hill north of Center st. will be prepared by Chas. C. Hopkins of Rome, N. Y. A. F. Bannon, Jr., cy. engr.

Wyandotte, Mich.—Special.—James G. Pinson, clk., says the question of establishing a filtration plant is reported under consideration by the Bd. of Pub. Wks. of this city.

New Egypt, N. J.—Plans and specifications for improving the waterworks system and constructing a tank and tower will be made by Walter E. Sexton, 1910 Market st., Philadelphia.

Cumberland, Md.—A proposition has been submitted to the board of water and electric light commissioners to furnish water to this city from the Savage River by gravity system.

Corning, N. Y.—Council voted Feb. 10 to ask Legislature to amend the water act of this city so as to permit the water commission to expend an additional sum of $25,000 on the municipal waterworks.

Waukegan, Ill.—John Erickson, C. E., of Chicago, recommends the removal of the waterworks plant to a point south of the present site; construction of 60-in. tunnel 11,000 ft. into the lake; location of curb east and a little north of harbor; installing pumps, boilers, etc. Mayor Bullock.

The construction of waterworks systems is contemplated at the following places: Vilroy, S. D.; Jonesboro, Tenn.; Lenoir, N. C.; Marysville, Mo.; Lewisburg, Tenn.; Battle Lake, Minn.; Tilden, Neb.; Velva, N. D.; Georgetown, Wash.; Bonestell, S. D.; Kennebec, S. D.; Lindsay, Neb.; Viborg, S. D.; Wakonda, S. D.; Waterville, Wash.; Southampton, Ont.

CONTRACTS TO BE LET.

Decatur, Ga.—Bids are asked until March 5 for constructing a waterworks system. E. H. Mason, clk.

St. Boniface, Man.—Bids are asked until March 15 for supplying 25 hydrants. Theodore Beetrand, mayor.

Aberdeen, S. D.—Bids are asked until March 11 for constructing a 6-in. artesian well. F. W. Raymond, cy. audt.

Decatur, Ga.—Sealed bids are asked until March 5 for constructing a waterworks system. John A. Montgomery, mayor.

Springfield, Mass.—Bids are asked until March 2 for supplying a quantity of cast iron water pipe. E. E. Stone, chm. bd. water com.

Ft. Monroe, Va.—Sealed bids are asked until March 7 for the extension of the water distributing system. Capt. R. H. C. Kelton, Q. M.

Huntley, Mont.—Bids are asked until March 12 for furnishing 55,000 barrels Portland cement. E. A. Hitchcock, Secretary of the Interior, Washington, D. C.

Boston, Mass.—Bids are asked until March 5 for constructing a water distributing system at Fort Andrews, Peddocks Island, Boston Harbor. Geo. L. Goodale, constr. Q. M.

Great Falls, Mont.—Bids are asked until April 3 for constructing 12 miles of main canal, 67 miles of laterals and 17 inches of waste water ditches. U. S. Reclamation Service, Great Falls.

Klamath Falls, Ore.—Bids are asked until April 15 for excavating the Keno Canal, near here, involving 80,000 cu. yds. earth and rock excavation. U. S. Reclamation Service, Washington, D. C.

Washintgon, D. C.—Bids are asked until March 30 for erecting a 100,000-gal. elevated steel water tank and tower at Naval Hospital, New Fort Lyon, Burton Co., Colo. Bureau of Yards and Docks, Navy Dept.

Winnipeg, Man.—Bids are asked until March 7 for steel well caissons. C. J. Brown, cy. clk.

Lewiston, Ida.—Bids are asked until March 4 for waterworks improvements. W. A. Smith, supt. W. W.

Orange, N. J.—Bids are asked until March 25 for pumps for the water system. Isaac Shoenthal, mayor.

Leesburg, O.—Bids are asked until March 12 for constructing a complete waterworks plant. W. H. Mason, clk. B. P. S.

Painesville, O.—Bids are asked until March 4 for furnishing 577 or more 3-8 to 6-in. water meters. H. P. Cumings, cy. engr.

Los Animas, Cal.—Bids are asked until March 30 for a steel water tank and tower at the Naval Hospital. Bureau Yards and Docks, Washington, D. C.

Milwaukee, Wis.—Sealed bids are asked until March 2 for furnishing 400 tons 5-in., 325 tons 12-in., 225 tons 16-in., and 550 tons 6-in. c. i. water pipe. Chas. J. Poetsch, chm. B. P. W.

Osceola, Ia.—Bids are asked until Mar. 14 for constructing an extension to the city waterworks, including 4,300 ft. 6-in. and 4-in. pipe fire hydrant connections, 8 hydrants and 2 valves. The city also desires prices on a filter system. W. N. Temple, cy. clk.

Saskatchewan, Alta.—Bids are asked until March 20 for laying pipe for waterworks and sewers, including 27,000 ft. of trenching; constructing concrete foundation for water tower; constructing sedimentation basin. Jas. R. Wilson, mayor.

Cincinnati, O.—Sealed bids are asked until March 11 for building pressure and return mains; the re-arrangement of elevator connections and service; re-installation of the Laidlaw, Dunn-Gordon Triplex pumps, No. 18,787. Wm. McLaren, supt. pub. serv.

Rolla, Mo.—Bids are asked until 7 p. m. March 4 for constructing waterworks and sewerage systems, requiring 21,000 feet water pipe, air compressor, 2 centrifugal pumps, Corliss engine and generator, concrete reservoirs, 33 hydrants and 10 flushtanks. Mayor.

Belle Fourche, S. D.—Bids are asked until April 10 for constructing sections 2 to 8 of the South Canal with appurtenant structures in connection with the Belle Fourche project, involving 900,000 cu. yds. canal excavation, 7,200 cu. yds. concrete, 1,295 lin. ft. tunnel. E. A. Hitchcock, Secretary Interior, Washington, D. C.

Salt Lake City, Utah.—Sealed bids are asked until March 7 for constructing 4,972 lin. ft. 36-in. and 7,032 lin. ft. 30-in. continuous wooden stave or cast-iron pipe, 898 ft. 30-in., 795 ft. 24-in., 793 ft. 18-in., and 2,376 ft. 12-in. cast iron pipe; taking up and relaying 3,300 ft. 16-in. cast iron pipe. F. J. Lemand, chm. B. P. W.; Louis C. Kelsey, cy. engr.

Williston, N. D.—Sealed bids are asked until May 5 for constructing canals and ditches in connection with the Burford-Trenton project, involving 420,000 cu. yds. earth excavation, 1,300 cu. yds. concrete, 10,000 lbs. structural steel. H. A. Stores, electrical engr., Williston; E. A. Hitchcock, Secretary of the Interior, Washington, D. C.

Great Falls, Mont.—Bids are asked until March 15 for constructing an earth fill dam and accessory structures, located on Willow Creek, about 5 miles northwest of Augusta; involving 7,500 cu. yds. open

cut excavation, 170,000 cu. yds. embankment, 620 lin. ft. lined tunnel, 130 cu. yds. reinforced concrete. E. A. Hitchcock, Secretary Interior, Washington, D. C.

New York City.—Bids are asked until March 7 for laying water mains in Central Park between 59th and 72nd sts. Moses Herriman, pres. park bd. Bids are asked until March 18 for constructing 10.73 miles of the Catskill aqueduct; until March 13 for furnishing and delivering cast iron special castings, Richmond boro; furnishing, constructing and remodeling the Ridgewood pumping station north side of Atlantic ave. between Logan and Chestnut sts., Brooklyn boro; furnishing, delivering and erecting coal weighing scales at various pumping stations. John H. O'Brien, comr. water dept.

CONTRACTS AWARDED.

Aberdeen, S. D.—The Witte Hardware Co. was awarded the contract for furnishing material for the waterworks, for $4,008.

Milasa, Minn.—The Des Moines Bridge & Iron Co. was awarded a contract for a steel tower and tank for this village for $4,800.

Mankato, Minn.—The contract for drilling a 10-in. well for this city was awarded to J. T. McCarthy of Minneapolis at $2.75 a ft.

Frontenac, Kan.—The contract for constructing a waterworks system was awarded Feb. 11 to W. E. Swanwick of Joplin, Mo., for $17,900.

South Bend, Ind.—The contract for a 2,500,000-gal. duplex power pump was awarded Feb. 16 to the Slatt Iron Works Co., of Dayton, O., for $4,150.

Pickneyville, Ill.—The contract for furnishing and erecting a steel water tower was awarded to the Midland Bridge Co., of Kansas City, Mo., for $4,364.

Belle Plaine, Minn.—The contract for drilling the waterworks well was awarded at $3.85 per ft., including all pipes, rods, cylinders, working head, etc.

Ft. Wayne, Ind.—Hoeffer & Co., of Chicago, were awarded the contract for relining the reservoir, and Wm. B. Hough & Co., of Chicago, the contract for structural work.

Pipestone, Minn.—The contract for an air lift pumping outfit for this city's pumping station was awarded to the Robinson & Cary Co., of St. Paul, and the Harris Air Pump Co., of Indianapolis, Ind., for $1,414.

New Orleans, La.—The contract for furnishing c. i. pipe was awarded to the Camden Iron Works, of Camden, N. J., for $1,273,288.20, and for laying it to the General Contracting Co., of New Orleans, for $419,527.50.

St. Cloud, Minn.—Contracts have been awarded as follows: Two hydrants, Waterous Engine Works Co., of St. Paul, $37 each; 133 tons of c. i. pipe, U. S. Iron Co., of Chicago, $38.75 per ton; gate valves and boxes and other fittings, Jas. B. Clow & Sons, of Chicago.

Minneapolis, Minn.—The contract for furnishing 5,000 meters more or less, to be furnished during the next two years, was awarded to the Pittsburg Meter Co., of Pittsburg, Pa., at $7 a meter. The contract for large meters will probably be awarded to the National Meter Co., of Chicago.

BRIDGES.

Birmingham, Ala.—A viaduct at 28th st. and 2nd ave. is contemplated.

Le Roy, N. Y.—Will vote on an appropriation for a new bridge over the Oatka River.

Marietta, O.—Bids are asked until April 1 for building 8 iron bridges. A. F. Cole, cy. engr.

Cleveland, O.—Will vote April 1 on issue of $700,000 bonds for repairing Central viaduct.

Scranton, Pa.—Common council will appropriate $75,000 as this city's share of the cost of building the Mulberry st. viaduct. Bids for the viaduct will be received after April 1.

Fresno, Cal.—A bridge over San Joaquin River at Skaggs Crossing near Herndon is contemplated.

Beaver, Ky.—Bids are asked until Mar. 12 for building a bridge over the Big Sandy River here. Co. judge.

Macon, Ill.—A steel draw bridge to replace the pontoon bridge recently destroyed by ice is contemplated.

Smithfield, N. C.—Bids are asked until March 5 for constructing a bridge across Neuse River. Bd. co. com.

Paola, Kan.—Bids are asked until Mar. 5 for constructing a number of bridges. W. M. Krumsick, chm. co. com.

Louisville, Ky.—Bids are asked until March 1 for constructing the Oak st. viaduct. Jos. P. Clay, cy. engr.

Lafayette, Ind.—Bids are asked until March 15 for constructing concrete and steel bridge. John P. Forsman, co. audt.

Norwood, O.—The officials of this city and the Hyde Park Business Club may join in securing a viaduct over Duck Creek.

Santa Barbara, Cal.—The county board is considering an issue of $100,000 bonds for improving and rebuilding bridges.

Grand Rapids, Mich.—A concrete bridge over Grand River at Pearl st. to replace the present structure is contemplated.

Woodland, Cal.—The boards of improvisors of Yolo and Solano have decided to build a wagon bridge over Pulah Creek at Winters.

Norwalk, O.—Bids are asked until March 4 for the sub-structure of the highway bridge at Clay Lick. H. L. Maddocks, co. engr.

Buffalo, N. Y.—Mayor McClellan favors an appropriation of $25,000 to cover the cost of preparing plans for a new bridge over East River.

Cleveland, O.—Bids are asked until March 9 for constructing a concrete arch culvert in Stronville twp. Julius C. Doen, clk. co. com.

San Diego, Cal.—Several bids are asked until March 7 for constructing a bridge across La Costa Creek in the Coast Road. Wm. H. Francis, co. clk.

Leavenworth, Kan.—Sealed bids are asked until March 4 for building a bridge over Wolf Creek and a concrete culvert in Fairmount twp. J. E. Niehaus, co. clk.

Chicago, Ill.—The contract for constructing a new bridge at the north branch of the river at N. Halsted st. was awarded Feb. 5 to Jules E. Roemheld, for $159,240.

Buena Vista, O.—The co. com. have decided to construct a steel bridge across Pine Creek at Clinton Furnace and a steel bridge across Pond River on Buena Vista Pike.

Belpre, O.—The construction of 3 suspension bridges across the Ohio River for electric railway purposes is contemplated. Albert E. Boone of Zanesville is interested.

Buffalo, N. Y.—Special.—Plans are being made by the bureau of engineering and bids will be asked soon for dredging and embankment work and rebuilding bridges at a cost of about $75,000.

Cleveland, O.—Sealed bids are asked until 11 a. m. March 2 for constructing a concrete steel culvert, concrete abutments

and steel concrete floor in Euclid twp. Julius C. Dorn, clk. com.

Dayton, O.—Sealed bids are asked until March 16 for constructing concrete abutments and 1 concrete pier for the bridge across Twin Creek, between Jackson and German twps. T. J. Kauffman, co. audt.

Columbus, O.—The business men and property owners in the wholesale district east of High st. and north of Gay st. are agitating the question of erecting a viaduct over the railroad tracks at 3rd st.

Hoboken, N. J.—Bids are asked until March 7 for constructing a new viaduct to connect 14th st. and this city. Hudson co. and roads connecting therewith. Walter O'Mara, clk. bd. chosen freeholders, Jersey City.

Des Moines, Ia.—Bids are asked until March 20 for erecting rip-rap work, concrete construction, etc., in the Des Moines and Raccoon Rivers, within the corporate limits of this city, estimated cost, $200,000. Geo. D. Dobson, cy. engr.

Camden, N. J.—Bids are asked until March 13 for constructing a superstructure 96 ft. long for a through truss highway bridge over Big Timber Creek at Clements Bridge, between Camden and Gloucester counties. J. J. Albertson, co. engr.

Columbus, O.—Sealed bids are asked until March 6 for rebuilding 14 locks on the Ohio Canal between Akron and Trenton, O., and such minor masonry structures as may be required; for the construction of 2 abutments and superstructures for Wolf Creek aqueduct; for the delivering of about 12,000 barrels of Portland cement at railway stations between Barberton, Tuscarawas and Coshocton; furnish lumber, cast and wrought iron or steel required for lock gates and minor structures. Bids are asked until March 5 for rebuilding 9 locks between Middletown and Dayton; 2 locks in Toledo; 1 lock in Defiance; Buckland's lock, about 2 miles west of Grand Rapids; constructing concrete dam 1,850 ft. long across Maumee River at Grand Rapids; concrete protection walls at abutments of Independence dam, 4 miles east of Defiance; 96 ft. cast iron culvert pipe at Melrose; concrete and iron head gate 3 miles north of Middletown; concrete culvert across canal 2 miles north of Franklin; 6 concrete and iron waste gates between Miamisburg and Lockland; 14,700 barrels of Portland cement. Chas. E. Perkins, chief engr. pub. wks. of Ohio.

STREET LIGHTING.

Maple Park, Ill.—An electric light plant is contemplated.

Baker City, Ore.—An electric light plant is contemplated.

Sioux City, Ia.—A municipal electric light plant is urged.

Tama, Ia.—Voted to issue bonds for an electric light plant.

Friend, Neb.—Voted to issue bonds for an electric light system.

Ladd, Ill.—Council has decided to install an electric light system.

Earlville, Ia.—An electric light plant is contemplated. Mayor Douglas.

Davenport, Ia.—The People's Light Co. contemplates laying 8 miles of mains.

Tekamah, Neb.—Will vote on issue of bonds for a new electric light plant.

Mt. Ayr, Ia.—Will vote March 25 on issue of bonds for an electric light plant.

Pella, Ia.—Will vote March 5 on the issue of bonds for an electric light plant.

Sauk Rapids, Minn.—Village council contemplates installing an electric light plant.

Tecumseh, Neb.—Will vote March 5 on the issue of $12,750 for a new electric light plant.

Topeka, Kan.—Plans are being prepared for an electric light plant. H. K. Goodrich, supt.

Farragut, Ia.—May vote on the issue of bonds for an electric light plant. E. E. Odell, cy. clk.

Thief River Falls, Minn.—The city electric light plant is to be enlarged. Leonard Peterson, supt.

Covington, Ky.—City council has appropriated $20,000 for establishing a municipal electric light plant.

South Sharon, O.—Will vote March 26 on the issue of bonds for erecting a municipal electric light plant.

Atmore, Ala.—The Atmore Ice & Electric Co. has been incorporated to establish an electric light plant.

Emery, S. D.—The Business Men's Association is agitating the question of establishing an electric light plant.

Marissa, Ill.—A meter system will probably be installed at the municipal electric light plant. J. R. Creighton, mgr.

Scranton, Pa.—Plans and estimates for a municipal lighting plant are about completed. C. R. Ackes, dir. pub. wks.

Louisville, Ky.—The bd. of pub. wks. is arranging to install about 400 new arc lamps to replace those now in use.

Painesville, O.—Plans are being prepared for rebuilding the municipal electric light plant. H. P. Cumings, cy. engr.

Crookston, Minn.—The Crookston Water Works, Power & Light Co. contemplates the construction of a power plant and dam.

Atlantic, Ia.—The citizens are considering the installation of a municipal lighting plant. Jno. J. Rapp is interested.

Holton, Kan.—Bids are asked until March 5 for installing a combined electric light and waterworks plant. S. D. Kuhn, mayor.

Dumcombe, Ia.—Will vote in the spring on the issue of bonds for constructing an electric light plant. M. L. Harkins, cy. clk.

Arcadia, Fla.—The Arcadia Electric Light, Ice & Telephone Co. contemplates the installation of a series arc circuit. Edmund Scott, mayor.

Putnam, Conn.—The Putnam Light & Power Co. contemplates installing a new engine and generator in its plant this spring. A. W. Bowen, mayor.

Vineland, N. J.—The Citizens Gas Light Co. has been incorporated to operate a gas plant here by L. H. Miller, E. F. Miller and H. Bartlett.

Holton, Kan.—Bids are asked until March 5 for equipping and installing a combined electric light and waterworks plant. S. H. Newell, Sr., cy. clk.

Natchez, Miss.—Sealed bids are asked until 4 p. m. March 7 for lighting this city for 10 yrs. Geo. T. Eisele, cy. clk.; S. B. Stewart, chm. light and water com.

Denver, Colo.—Mayor Speer has announced that the city is ready to receive designs for ornamental lighting system to be established on 15th and 17th sts.

Prineville, Ore.—Bids will probably be received in May or June for constructing a plant for the Pringle Falls Electric Power & Water Co. L. B. Lafolett, sec.

Jacksonville, Fla.—The contract for 2 boilers for the city electric light plant was awarded to the Babcock & Wilcox Co., 85 Liberty st., N. Y. City, for $15,679.

Gary, Ind.—The general contract for installing a gas plant for the U. S. Steel Corporation here has been awarded to Hugh McLennan of Chicago for $200,000.

Thomasville, Ga.—The citizens contem-

plate the installation of a 60-cycle, 3-phase direct-connected unit in the municipal electric light plant. D. R. Pringle, supt.

Los Angeles, Cal.—Lieut. Randolph Miner, J. F. Sarton, J. E. Fishburn and others are interested in the proposed construction of a gas plant here to cost $3,000,000.

Elberton, Ga.—Plans are being prepared for installing an additional engine of 125 h. p. and an alternator in the municipal electric light plant. G. W. Hubbard, supt.

Dawson, Minn.—Bids are asked until March 11 for $28,000 bonds for establishing, erecting and purchasing an electric light and waterworks plant. Jas. O'Haren, pres. vil. coun.

Escanaba, Mich.—Council has directed that an expert electrical engineer be engaged to investigate the condition of the electric plant and report the necessary improvements.

Morristown, Tenn.—This city has appropriated $350,000 for the purchase of new machinery and making improvements to its electric light and waterworks plants. Gas. Mathers, supt.

Jacksonville, Fla.—Plans are being formulated for installing 2,500 h. p. boilers and a new chimney and the construction of a dam for the municipal electric light plant. R. N. Ellis, supt.

Ellsworth, Me.—The contract for constructing a reinforced concrete dam, power house, canal transformer house, etc., was awarded to the Ambursen Hydraulic Constr. Co., 176 Federal st., Boston.

Clinton, Ia.—The Clinton Gas Light & Coke Co. contemplates the installation of an additional 800 h. p. engine and generator, boilers and condensers, pumps, etc., and new gas apparatus. Thos. Crawford, engr.

Washington, D. C.—Sealed bids are asked until March 12 for the power plant equipment and for the construction of the power house for the U. S. Dept. of Agriculture. Bldg. com. U. S. Dept. Agr.

Velva, N. D.—City council will soon be ready to engage a competent engineer to make plans and specifications and superintend the construction of an electric light plant and sewerage and waterworks system. G. N. Livdahl, mayor.

Knoxville, Tenn.—Wm. F. Cox, of New York, J. J. Wetmore, of Philadelphia, and T. L. Merchant, of Boston, are interested in an enterprise that contemplates the construction of a dam across the Cumberland River and a power plant, about 25 miles from Williamsburg, Ky.

Buffalo, N. Y.—Sealed bids are asked until March 5 for one 25 h. p. 4-cycle auto marine engine, with four cylinders about 4¼ in. diam., of the open base, long stroke, jump spark type, complete with carbureter, mechanical oiler, single unit spark coil and distributer, reverse clutch, thrust bearing, one set dry batteries, starting handle, one 1¼-in. Tobin bronze shaft, 6 feet long, with a two-blade bronze propeller wheel, keyed to same on taper bearing, bronze stuffing box, wrenches, oil cans, etc., delivered f. o. b. factory. F. G. Ward, com. pub. wks.

PARKS.

Spokane, Wash.—Sites on West Riverside ave. have been purchased for the establishment of a park.

Portland, Ore.—Will vote in June on the issue of $1,000,000 bonds for the extension of the city park system.

Grand Forks, N. D.—A triangular tract at Reeves and 4th aves. and 6th st. will be converted into a park this spring.

Pittsburg, Pa.—Secretary Taft has made an order leasing the upper portion of the U. S. Arsenal grounds to this city for park purposes.

St. Louis, Mo.—Mayor Wells has signed a bill authorizing the mayor, comptroller and park commissioner to select sites for public parks in the congested sections of this city.

Washington, D. C.—In a letter read at a "playground banquet" Feb. 20 given under the auspices of the Washington Playgrounds Association, President Roosevelt advocated municipal provision for playgrounds for every child as much as schools, within easy walking distance of every boy and girl, and properly supervised by the cities.

GARBAGE DISPOSAL, STREET CLEANING AND SPRINKLING.

Benwood, W. Va.—City council is considering the construction of a garbage crematory.

Grafton, W. Va.—A bill is before the Legislature providing for the construction of a garbage crematory.

Hattiesburg, Miss.—The question of constructing a garbage crematory is being considered. Dr. J. D. Donald, mayor.

Wilkes Barre, Pa.—The sanitary commission will recommend the installation of a crematory. Evan Challis, chm., 376 E. Market st.

Norfolk, Va.—Common council has taken initiatory steps toward the erection of a crematory by appropriating $30,000 for that purpose.

Zanesville, O.—The contract for constructing a garbage disposal plant was awarded to the Decarie Mfg. Co., of Minneapolis, Minn., for $18,950.

New Brighton, N. Y.—Special.—J. T. Fetherston, supt. st. cleaning, says the contract for a refuse destructor to be erected at West New Brighton, boro of Richmond, was awarded to Heenan & Froude, 111 Broadway, New York City, for $23,995.

Milwaukee, Wis.—A resolution has been introduced providing that the chairman of the committee on health, the city engineer and the health commissioner shall visit the cities of the East and investigate the systems of garbage disposal.

FIRE APPARATUS.

Princeton, Minn.—The fire department will purchase additional equipment.

Benson, Minn.—Council is considering the purchase of 1,000 ft. of fire hose.

Sheboygan, Wis.—City council is considering the purchase of a new fire engine.

Sioux Falls, S. D.—The purchase of an aerial ladder truck is recommended by the fire chief.

Springfield, O.—Bids are asked until March 4 for furnishing new hose. Frank Crollers, cy. clk.

Joplin, Mo.—The question of increasing the equipment of the fire department is being considered.

Chattanooga, Tenn.—Will vote March fire halls and to purchase equipments and 12 on the issue of bonds to build 2 new apparatus for the fire and police departments. J. B. Rayon, chm. com. registration.

Providence, R. I.—A resolution has been introduced to add $14,000 to the appropriation for the maintenance of the fire department, the purchase of 2 or more steam fire engines and a combination hose wagon. Mayor McCarthy.